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THE LONDON NATURALIST

The journal of the
LONDON NATURAL HISTORY SOCIETY

No 67

Published 1988
Price £4.00

LONDON NATURAL HISTORY SOCIETY

The Society welcomes new members, both beginners and experts. Its Area lies within a 20-mile (32 km) radius of St Paul's Cathedral and here most of its activities take place. Although much covered with bricks and mortar, it is an exciting region with an astonishing variety of flora and fauna. The Society comprises sections whose meetings are open to all members without formality. For those interested in arachnology, archaeology, botany, conchology, conservation, ecology, entomology, geology, herpetology, mammalogy, ornithology, palaeontology or rambling, there is a section ready to help.

Publications

The London Naturalist, published annually, contains papers on the natural history and archaeology of the London Area, including records of plants and animals.

The London Bird Report, also published annually, contains the bird records for the London Area for each year, as well as papers on various aspects of ornithology.

Bulletins of news items, including the Society's *Newsletter* and the *Ornithological Bulletin*, are sent to members throughout the year.

Indoor meetings

These are held in most weeks throughout the year, with lectures, discussions, colour slides and films on all aspects of natural history.

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Led by experts to visit interesting natural history localities, many outside our Area. These excursions are very popular with beginners wishing to increase their knowledge and enable members to get to know one another.

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A large selection of books and journals on most aspects of natural history is available for loan or consultation by members free of charge.

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The Membership Secretary, P. C. Holland,
Flat 9, Pinewood Court, 23 Clarence Avenue,
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THE LONDON NATURALIST

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THE LONDON NATURALIST

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Stanley Cramp on the Isle of May, summer 1949. *Photo: W. G. Teagle.*
The London Naturalist, No. 67, 1988.

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† Deceased February 1988. An obituary appears on p. 178.

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Report of the Society for 1987*

The Society continues to be active in recording London's natural history. Work on the butterfly atlas is now complete. It will be published around the turn of the year and will cover the history and distribution of seventy-two species. On the ecology and entomology side, work on recording nine groups of vertebrates and invertebrates goes on. A particular feature this year was the re-discovery in Oxleas Wood by Edward Milner of a very rare spider *Micrommata virescens* which was last seen in the London area 200 years ago; the Wood is under threat from a road development and the information was passed on to the Secretary of State for Transport.

The botany section has been taking an active part in the B.S.B.I.'s two-year monitoring scheme of the British flora (1987-88) by covering the tetrads selected within the Society's area; several meetings were arranged with that in mind. On the ornithology side, 1987 saw the conclusion of the fieldwork for the Woodland Bird Survey; over 90% of woods by area should now have been covered. A project was also started to study bird life in selected Inner London sites; this should provide more information about the birds using the small open spaces in the centre of London with about 40 sites being covered this year.

The Society is to give a grant of £1,000 to the B.T.O. building appeal to enable them to establish a National Centre for Ornithology at Tring.

The sections are as active as ever in organising a varied programme of meetings. The Geology Section has been notably successful with its coach trips and the section is building up membership well under Richard Goulding's leadership. The practice of the Ramblers and Archaeology section in arranging meetings on weekdays has proved popular and it enables members to visit places which are closed at weekends.

On the publicity side, the Society now has several display panels which have been used at a number of shows and exhibitions this year; there are plans to develop these further. The Society's *Newsletter* contains details of sectional activities and much other interesting material. In addition, the Ecology and Entomology Section now has its own newsletter, *The London Atalanta*. This appears every other month and contains a record of both indoor and field meetings organised by the section.

A total of 157 new members were enrolled during the year ended 30 September 1987, compared with 164 in the previous year, but 121 names will be deleted this year for non-payment of subscriptions. The deaths have been reported of Mrs N. Filtress, H. A. Toombs (a former General Secretary), D. A. Lilliman, Professor E. H. Warmington and Stanley Cramp, the last two being Honorary Vice-Presidents.

The membership figures are as follows:

	30 Sept. 1987	30 Sept. 1986
Ordinary	1,028	} 1,345
Family	132	
Junior	22	
Senior	86	
Honorary	15	
Life	6	17
Affiliated	19	8
		17
Total	1,308	1,387

Our thanks as usual go to all the officers and sectional committee members who work so hard for the Society. Thanks also go to Imperial College for the use of the rooms and to Mrs Czigany and her staff for custody of the Society's library.

*Presented at the Annual General Meeting, 9 December 1987.

Did They Fall or Were They Pushed?

A Consideration of the Current State of Natural History Societies

by MICHAEL WILSDON

(Presidential Address delivered at the Annual General Meeting on 9 December 1987)

Introduction

The subject of the talk is the current state of the natural history society in Southeast England. There may be relevance to further parts of the country, but this is the only area of which I can speak with any certainty. I have assumed there has been a general decline in the membership and activity of natural history societies in Southeast England, although the absence of any co-ordinating body or forum makes this difficult to test. The responsibility for natural history societies was taken on in 1980 by CoEnCo when the Council for Nature closed. In 1980 a working party was set up to see whether there was a need for an umbrella body for such societies and some 400 were circulated with questionnaires, but only 10 actually replied. CoEnCo subsequently attempted to set up a further Natural History Society Conference and it is in reading the replies that I base my assumption for the gradual decline of them.

The L.N.H.S. has, however, continued as an extremely active body without signs of decline. There is a sad note for this Society at this particular AGM in the imminent move to Hampshire of Vic Hancock who is now an Honorary Vice-President in respect of his many years of organising and involvement within the Society. If we look back 22 years to his Presidential Address entitled 'The Society Today' we see certain themes such as accommodation for the Society, Bookham Common research and use of the library, as themes that are with us today. I have to repeat one item which is the continued thanks to the hardworking officers of the Society who provide such a number of variety of meetings and publications. Within the next few days another Society publication, *Butterflies of the London Area*, will be available.

Vic Hancock was confident of the Society's future. I too have shared that optimism, though perhaps it is time to consider why one should be optimistic for this Society and pessimistic in general for the average natural history society. To consider whether the assumed decline in natural history societies has been from internal or external causes, I have chosen to concentrate on one particular small Society and then compare that Society's decline with events within our own Society. I have chosen to study the Portsmouth Natural History Society since this was the first Society of which I was ever a Committee Member and have retained contact ever since. I have also had the opportunity of reading the Minute Books for the last 30 years as well as the various publications, etc. The advantage of this particular Society is its relatively small size plus clear boundaries. While I may consider that the Portsmouth society has not prospered I should make clear that this is my own view and my comments are my own. I have stressed certain causes within this decline which might not be considered the most important, but this is a comparative talk between the two Societies and it is the future of the L.N.H.S. that is of the greatest interest to us tonight.

Role/Function of a Natural History Society

I would consider that there are four major functions of a natural history society:

1. The naturalists of a local area joining together for enjoyment of mutual interests whether this be talks, meetings or outings, etc.

2. Naturalists joining together for the specific recording of their local area.
3. Naturalists within a local area joining together for the conservation of that area perhaps with a local reserve as a focus.
4. Naturalists of a local area using a Society as a publication vehicle for their records of that area.

Membership of the Portsmouth Natural History Society

I have shown the membership, student membership and subscription levels. The programmes have been checked for specific details.

1948-1986

<i>Year</i>	<i>Membership</i>	<i>Numbers</i>	<i>Subscriptions</i>	
			<i>Adult</i>	<i>Junior</i>
1949	80	—	—	
1967	200	44	7/6d	3/6d
1970	200		10/-	8/-
1976	180	22	£1	25p
1977	152	13	£1	50p
1980	122		£1.50	75p
1984	127	6	£2	£1
1986	100	6	£4	£2

Membership. The Society commenced in 1948/49 and there were 80 members by 1949. Until the early 1960s the Committee was an efficient recruiting machine with each Committee member recruiting several new members each year. By 1967 there were 200 members and this membership level remained until 1976. Subscription levels then increased and membership numbers went down. Numbers were then held from 1980 to 1984 when there was a further decline. The Committee discussed dissolution of the Society in 1986 but revived in 1987.

Student membership. A fascinating set of figures. The Portsmouth Society was founded by a group of biology teachers and in due course the local Polytechnic attracted a good biology faculty. There is a good beginners area on the doorstep in the form of Langstone Harbour. Student numbers, however, declined from 44 to 6. There is a fairly even decline, but from the figures the subscriptions do not appear relevant.

Subscription. Nothing remarkable about the subscriptions which were basically to cover costs and no more.

Constant

The constant items would appear to have been:

- a. The actual physical area, apart from a few new roads, remained fairly similar. There was no exceptional habitat loss.
- b. There was relatively little Naval involvement by Royal Navy Birdwatching Society at the beginning or now for this Society.
- c. The social class mix in the area has seen no radical change except the continued development of housing areas outside the City which bear little relationship or contact with Portsmouth.

Changes

Local and national changes have been:

- a. **Competitive Specialisms.** Nationally the rise of the specific societies has not necessarily been good for the local societies. Competent all-round field naturalists were probably always rare but they seem extremely rare now. Partly, at least, because the sheer increasing knowledge in each area makes it difficult to enjoy a

general approach and partly too because of removals of restraints on travel which might in the past have led to indepth studies of particular small areas. The local groups of the Mammal Society or B.S.B.I. act as competition for time and money. Also the local groups may well prove more enjoyable because of a shared interest. This is aided by improved field guides and identification texts.

b. Popular Generalisms. Organisation such as the R.S.P.B. or the National Trust will compete for subscription monies and offer reserve or site access. While the national societies are no threat, they may prove a deterrent to the floating member wondering whether he can cut out a sixth or seventh subscription. Also, where local groups of the R.S.P.B. are set up these may be found to be more socially enjoyable where there is only a limited interest in the subject.

c. Conservation/Ecology. Organisations such as the county trusts will again take subscriptions in competition. They also project a more concerned image and require participation without knowledge. They also, in the case of the County Trusts, save the countryside.

d. Costs and Time. Specialisms cost money whether subscriptions or equipment. Similarly, if you are never anywhere near your local area except from brief returns from 'twitching' in Norfolk, then your need for a natural history society is marginal. And if no new members are recruited before they have decided to take up a particular specialism, then you have no new members and no society. From former student members of the Portsmouth Society that I have spoken to, this is the clear message. There is neither the time nor the money to add another subscription for a society with which there would be limited involvement. The rise of separate branches of the national societies has attracted away the keenest members. The rise of the county trust was of course welcomed by the society as it meant there was then an effective focus for the conservation needs. To commence with, the society and the trust would have acted in tandem, partly through sharing the same keen members. But slowly the role of the society was reduced to a mere local involvement in Langstone Harbour. The society had nothing particularly effective to say and was not really able to put over what it wanted to say. The county trust had taken over all these roles even though at times it might be considered to be ineffective in acting at the county borders. The main message is that those members who wished to participate and be involved in conservation matters, etc, knew that the county trust was the organisation within which they needed to work.

e. Goodwill and Advertising. The Portsmouth Society, having been closely linked to the Portsmouth Polytechnic, suffered when that Polytechnic was no longer able at a reasonable cost to offer rooms for meetings. It was this useful contact with the Polytechnic that had in some ways kept the subscription down. In return the Polytechnic had been able to run the Society's journal which was a useful outlet for both lecturers and students. But with the decrease of any interest in general natural history by the biology faculty, the relevance of the Society to the Polytechnic and vice versa declined. The Society was hardest hit since it had relied on the free facilities. A problem here is the typical fear involved in advertising the meetings. A lot of people turn up for a meeting with a particular star speaker but you do not appear to attract a great number of new members.

f. Changes in Professional Support. A decline in interest and general field ability by the local professionals had led to the natural leaders and organisers being markedly absent. The decline of good field trip leaders soon reduces a Society's outings to mere rambles. I will not dwell here whether there are any amateurs left with the rise of the professional ecologists.

Effects

So over the last 25 years there have been three main effects.

The field meetings have slowly declined through lack of support. Greater ease

of individual travel has made the coach outings less attractive and the lack of field trips on offer has, of course, led to less members.

The increasing involvement of the keenest and most able Society members with the County Trust and the Hampshire Ornithological Society (once freed of the Hampshire Field Club) has leached the local societies of organising talent. It has also spread the keenest members too thinly to be effective at all levels. They have thus been able to avoid co-ordinated action because they have an individual on whom they can fob off any particular representative tasks. In the long run this has proved weakening for most if not all small societies.

With the reduction in outings and talks together with increases in subscription because meeting-hall costs etc. have to be met in full, the attractiveness to join has declined, at the same time as the rise of other alternative organisations. Thus membership numbers once on the decline prove very difficult to halt because of the lack of recruitment of young members. It is the cry of the majority of small natural history societies that it is the lack of any good young recruits that is killing off the societies. In the case of the Portsmouth Society this has been true. Its future depends on a period of stability with adequate recruitment. If not, it will surely disappear.

Comparison with the L.N.H.S.

The major flaw in this comparison is, of course, the size of the London area. There can be no competitor in the form of a county birdwatching society since this society is the equivalent of any county society and in terms of the journals produced probably superior. Thus one potential source of competition is naturally removed.

Rival specialisms and the removal of members is, however, a problem. I think that the Society cannot rely on a generalised mass of members who will each take a certain amount of interest in most subjects. The Society has to rely on attracting the specialists who are anyway based in London. Thus the sections of the Society must aim for the highest possible quality of talks and outings because this is the way to attract members and provide an enjoyable and productive society. If a national society has its headquarters in London then this is an opportunity for the Society to increase rather than to give up in the face of a rival. The progress within the Society of the Ecology and Entomology Section has been most heartening. I look forward to the Geology Section becoming similarly successful.

The Ornithological Section has consistently aimed at a quality market-place. The rise of the R.S.P.B. local groups is thus both a challenge and a recruiting ground. I can see no reason to change this Section's approach since any dilution in the aims will render the Section indistinguishable from a local group, except insofar as the recording of the London area is in our hands and the survey work especially so. It is this recording and research, together with the *London Bird Report* that gives continued meaning and involvement to much of this Society. Unlike a small society whose publications are occasional and not necessarily meaningful, the *L.B.R.* provides focus for the London records plus a publishing place for all the survey work.

Referring back to Vic Haneoek, his talk was given before the founding of the London Wildlife Trust. It is difficult for the Trust and this Society not to encroach on similar territories but from the point-of-view of the members, I think London is quite capable of providing sufficient memberships for both organisations. In fact the major problem for each organisation is the normal London-based turnover of members. The movement of people through the capital plus a natural change of interests leads to a fluid membership. In the same way that one can see some benefits in a combined membership of, say, the B.T.O. and a local birdwatching society, there is some sense in combined L.W.T. and L.N.H.S. subscriptions. This might limit the rate of turnover.

There is a similarity between the Portsmouth and the London Societies in that both paid a reduced amount in respect of lecture-rooms etc. This is no longer predominantly the case for the London Society and in the absence of any owned accommodation, it seems most unlikely that the Society will have free rooms in future. The Society currently benefits from the facilities at Imperial College and the British Museum (Natural History) although as the Society Library is currently with the former institution, the overall debt is more to this Society. However, as the Portsmouth Society suffered so greatly with the lack of interest by its local Polytechnic, so this Society should be warned for the future. All educational and similar establishments are necessarily more cost conscious than once they were.

As the Portsmouth Society declined so the field trips were rationalised and then abandoned. At certain times these trips were held as joint meetings with other local societies. However, once the trips were abandoned then the membership continued to decline because this expected facility was not on offer. This is a difficult problem to resolve since nothing so disappoints a field leader as a lack of a party. Whereas the link to the rail system is feasible with a London-based trip, this had long ceased to be sensible in Hampshire. A high quality of outings has been the hallmark of this Society and this must continue since there are now rivals in this field, especially for general birdwatching. From my own personal experiences the best birdwatching outings I have ever been on were with the West Midland Bird Club in the early 1970s. They provided a guide for me to the area together with the confidence of a Leader would show everything of interest. It is only the L.N.H.S. that has, in my experience, approached such high standards although I would not wish to comment on a trip that I have actually led myself.

A difficulty for a small society is exactly where to advertise to attract new members. Membership is normally therefore obtained by personal recommendation and this can become a difficult and tiring procedure once the Society has commenced its decline. There are not enough facilities on offer for the Society to be successfully sold. This Society does in part share this problem in membership involvement in recruitment.

Lessons for the L.N.H.S.

1. The Society must beware over-dependence on any organisation whose goodwill or free support might be withdrawn. The Society has to stand on its own assets and subscriptions must be realistic to ensure that no sudden change of policy will disrupt the day-to-day business of the Society.
2. The publications need to be supported. The *London Bird Report* provides birdwatchers with a reason for joining together with current and past records and a detailed analysis of their survey work. *The London Naturalist* has a similar role for the other Sections plus being a scientific journal in its own right.
3. The individual Sections must be good enough to ensure recruitment of individuals who will anyway join the national specialist organisations. These are the members who will join, strengthen and enjoy all the various facilities of this Society.
4. The Society must remain an enjoyable and friendly society to belong to. For the natural history societies generally, are there any examples from this London Society?
 - a. The local society needs to be a very good social organisation and thus may well benefit if there is a lack of any rival branches of national organisations.
 - b. A local society will only gain if it is linked to a reserve or publication which will continue to provide a focus for the Society's efforts year in year out.
 - c. If one looks back over the Society and other bird clubs, societies, etc, there is one running theme which is the rise and fall of the various branches within the

major society. The Society has to be flexible and reflect where its members actually live and want to meet. Thus this Society is always willing to arrange joint local meetings within the London area.

To refer back to the title, I think it is fair to say that many local societies have in a sense been pushed rather than falling of their own accord. However, since the Naturalists Trusts sprang from the involvement of the local societies, it may fairly be said that it was the very success of the local societies that proved their undoing. It is to this trust theme that I shall return next year.

Book Review

The Dragonflies of Europe. By R. R. Askew. Harley Books. Colchester. 1988. 294pp., including 31 colour plates, 502 text figures and 116 maps. £49.95. ISBN 0 946589 10 0.

Cynthia Longfield described Hammond (1983) as 'the Dragonfly book of the Century'. Askew is even better. His stated aim is to simplify the identification of European dragonflies and he has succeeded brilliantly. According to the N.C.C. (Chelmick *et al.* 1980) there are 37 resident breeding species of Odonata in Britain, plus four now extinct and three rare migrants. Hammond (1983) adds another one, *Coenagrion lunulatum*, found in Ireland. All of these are included in the 114 species covered by Askew. The inclusion of an extra 69 species, covering the whole of Europe, however, demands more identifying characters and Askew provides them in a clear and practical way.

However the book is not a field guide. It is quite useless to suppose that you can pop it in the car when you next go to France, net the first unfamiliar dragonfly you see, and while holding the reluctant insect carefully in your left hand, flip uncerringly to the right page and instantly identify it. This might be possible with a few species as the plates are very good. They are fine screened and 4-colour printed from meticulous water colour paintings by the author. He projected an enlarged image of each specimen on to a screen and traced the outline to ensure accuracy of shape and proportions. Damselflies are shown $\times 2.70$ life size and dragonflies $\times 1.35$, which, allowing for inevitable limitations of the printing process is just big enough. When you start trying to identify these beautiful insects in the field, however, you soon discover that a disconcertingly large number of damselflies are blue, and dragonflies – including immature stages – yellow. Moreover, even with a close-focusing lens, you can't always see the detail of the wings, even if you know what you are looking for.

Askew provides distribution maps (including where necessary, national boundaries) and habitat notes to show what dragonflies are likely to be where, and detailed black and white drawings of the most usual body markings to discriminate between superficially similar species. For example, the 14 male *Coenagrion* species illustrated on page 77, are likely to be a great help in sorting out the little blue jobs.

Very few dragonfly enthusiasts these days like collecting specimens of either adults or larvae. It's depressing and bad for conservation. Askew recognises this. The introduction to his key to final-instar larvae specifically refers to identifying cast off larval skins or exuviae. The key is intended mainly for identification down to genus. Not enough work has yet been done on larvae for unambiguous species identification especially in large genera.

Askew has produced the whole of this book himself: text, plates, line drawings and maps, though obviously he acknowledges a debt to various sources, both published and unpublished. The whole, including an excellent bibliography of nearly 600 references to the European literature amounts to a very impressive, elegant and meticulous piece of work. It is a book that is so comprehensive that every serious dragonfly watcher will welcome it and so friendly that no beginner need be afraid of it. In fact, I can find only two things wrong with it, the price and the fact that it weighs 1,290 grams, or 2lb 13½oz.

References

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Fossiliferous London Clay and 'London Clay Basement Bed' Temporary Sections in the 1920s around Harrow, Middlesex

by the late HARRY A. TOOMBS and JOHN COOPER*

Abstract

Harrow, NW of London, is now a built-up area, but in the 1920s when development was at its peak, temporary sections in the London Clay and its 'Basement Bed' yielded faunas which are here listed.

Lists of fossils from the London Clay of northwest Middlesex are not all that common, so when I turned up a few in my old notebooks it seemed a pity not to publish them, suitably brought up to date. One of us (H.A.T.) is responsible for the narrative and reminiscences, the other (J.C.) for unearthing the specimens (which are all in the British Museum (Natural History)), for correcting the molluscan names (Tables 1 and 2) and for generally knocking the manuscript into shape.

As a boy at the Harrow County School (1922-1927) I could walk through fields and spinneys from Harrow, through Pinner to Eastcote. The River Pinn and the Yeading Brook were the clean homes of sticklebacks. Through these fields walked a little band of nature-lovers who had clubbed together to form the ephemeral 'Harrow and District Field Club'. Among the members were John Pringle, later to become Director of the Geological Survey's Scottish Office, Arthur Morley Davies, Professor of Geology at Imperial College and Hugh Braun, the Ecclesiastical Archaeologist. My father was a founder member: some chaps have all the luck! But then I saw the engulfment of the countryside: trenches were dug and I was down in them, to the detriment of my homework, though I learnt some good basic English from the navvies.

John Pringle encouraged me to collect and to him and Arthur Wrigley I owe my early enthusiasm. Both had the rare ability to inspire the young. It was in one of those trenches that I met a stranger and, as schoolboys will, I gave him all my accumulated knowledge of the geology of the area: some twenty years later he reminded me of this – it was Tommy Eastwood, revising the North London Memoir. These and later studies were acknowledged by Hester (1942: 305).

Until I met Arthur Wrigley, in 1925, I took all my specimens to that tumbling ruin in Jermyn Street where the Geological Survey lived and where Kitchen and Pringle always gave me a warm welcome in their studies, knee-deep in unwashed crockery. At the Natural History Museum I got a helpful but cool reception, but I only took there the tatty material discarded by the Survey. With one poor specimen, Dr L. R. Cox took me into Gallery 10 where the corals were then abundantly displayed, showed me a Barton coral and said I should have spent more time looking for myself. Many years later, Fred Stinton identified it as a section through an otolith. By the time of the Geologists' Association visit to Harefield in May 1922, thanks to a bicycle I had made quite a respectable collection from the Basement Bed claystones of the Great Pit (TQ 048909), but according to my notes it was not until the winter of 1923-24 that I made my first London Clay collection from a temporary section, which was:

GERARD ROAD: The specimens came from London Clay septarian nodules thrown up from a sewer trench, not more than ten feet deep, that ran the length of

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Gerard Road, surface O.D. 200 feet, a quarter of a mile west of the L.M.S.R. Station, Kenton, Middlesex, Grid Ref. TQ 163883. The nodules came from the lowest 100ft of the London Clay. A list of specimens, named by Dr Pringle, was published in Bromehead 1925: 23: '*terebella* sp., *Teredo* sp., *Nucula bowerbanki* J. de C. Sowerby, *Pecten* sp., *Pseudamusium corneum* (J. Sowerby), *Solidula simulata* (Solander), *Aporrhais sowerbyi* (Mantell), *Natica labellata* Lamarck, *Pyrula smithi* (J. de C. Sowerby) and a fish scale.' Specimens extant in the Natural History Museum, South Kensington have been identified as follows (with their registration numbers): *Pecten duplicatus* (LL 13963), *Nucula bowerbanki* (LL 13964-5), *Pteria papyracea* (LL 13967-8), *Amusium corneum* (LL 13966), *Ledina amygdaloides* (LL 13973-5, LL 13969), *Nuculana oblata* (?) (LL 13970), *Tornatellaea simulata* (GG 869), *Aporrhais sowerbyi* (GG 877), *Euspira labellata* (GG 881-2), '*Dentalium*' sp. (GG 878-9).

CANNON LANE: In July 1924 I rescued a few 'Basement Bed' claystones from a trench at about 150ft O.D. that was already being filled in, along Cannon Lane, about 1 mile south of St John's Church, Pinner, and near Down's Farm, Pinner, Middlesex (Grid Ref. TQ 122881). The claystones yielded 'many fossils', according to my notes. B.M. (N.H.) material identified: *Aporrhais sowerbyi* (GG 1055) only; *Cyrtodaria rutupiensis* is recorded in Wrigley's MSS.

KINGSBURY: From November 1924 to March 1925 a sewer tunnel was dug, from 36ft to 80ft below Fryent Way (surface O.D. just below 200ft), about half a mile NW of St Andrew's Church, Kingsbury, Middlesex (Grid Ref. TQ 196877). An otolith from this collection was identified by Stinton 1966: 415, 430 as *Brotula arcuata* sp. nov., reg. no. P. 28606. Other material in the Museum: *Abra splendens* (LL 14108-14114), '*Arca*' *tumescens* (LL 14122), *Lentipecten corneum* (LL 14116-14118), *Ledina amygdaloides* (LL 14130-14134), *Nucula bowerbanki* (LL 14123-14126), '*Pecten*' *duplicatus* (LL 14119-14120), '*Pteria*' *papyracea* (LL 14105-14107), *Thyasira angulata* (LL 14127-14129), *Tellinidae*? (LL 14121), *Euspira glaucinoides* (GG 1004-1008), *Mambrinia* cf. *gallica* (GG 1015-1016), *Sinum clathratum* (GG 1001), *Surculites velatus* (GG 1013), *Tornatellaea simulata* (GG 1009-1010), *Turridae* (GG 1019, GG 1011-1012, GG 1020), *Antalis anceps* (GG 1017-1018), *Antalis* sp. (GG 997-1000).

NORTH HARROW 1: In December 1924 and January 1925 a sewer cutting reached the Basement Bed of the London Clay at Hooking Green. Most of the specimens came from claystones below what is now the front garden of 37 Woodlands, c. 400 yards NW of the North Harrow Metropolitan Railway Station (Grid Ref. TQ 134890). The cutting did not reach the Reading Beds, but showed the upper pebble bed of the Basement Bed and the sandy clay below with claystones at 10ft from the surface. Fruits in this collection are recorded by Chandler 1961: 113-114 as *Jenkinsella apocynoides* Reid & Chandler, and *Carpolithus* sp. (reg. nos. V 29720 and V 29721). Other material in the Museum: *Astarte subrugata* (LL 14052), *Arctica morrisi* (LL 14065), *Glycymeris plumstediensis* (LL 14058, LL 14066-14067), *Pitar vaghiacarium* (LL 14042-14044, LL 14053, LL 14059-14063, LL 14064), *Lyonsia* sp. (LL 14028-14037), *Panopea intermedia* (LL 14038-14041), '*Tellina*' sp. (LL 14054-14055), '*Teredo*' sp. (LL 14068-14069), *Aporrhais sowerbyi* (GG 941-945), *Bonellitia* sp. (GG 937-938), '*Bulla*' sp. (GG 919-920), *Cochlespira gyrata* (GG 932-934), *Tornatellaea simulata* (GG 935-936), *Turridae* (GG 939-940). Some fish remains from 'North Harrow' are recorded in White 1931: 22, 26, 39, 106.

PAINES LANE: In June 1925, just north of Pinner cemetery, a sewer trench was cut for a new road, East End Way. It ran from west to east, from Paines Lane

to Moss Lane, starting 102 yards south of Paines Bridge and some 330 yards north of St John's Church (Grid Ref. TQ 124900). The trench showed a section in the 'Basement Bed': a maximum of 2ft of subsoil, 2ft 6in in brown sandy clay, 9in of pebbles with sharks' teeth, 5ft of brown sandy clay with fossiliferous claystones, resting on the mottled clay of the Reading Beds. The claystones yielded: *Amygdalum depressum* (LL 14194); *Astarte* sp. (LL 14185-14191), *Corbula* sp. (LL 14193), *Nemocardium plumsteadianum* (LL 14197-14201), *Panopea intermedia* (LL 14183-14184), 'Bulla' sp. (GG 1049), *Euspira glaucinoides* (GG 1052-1053), Turridae (GG 1054).

It was through exhibiting some of the specimens from these five localities at a Harrow County School Parents' Day on 9 July 1925 that I met Arthur Wrigley. It was he who lured me away from Harrow to exotic places like Bracknell, while Pringle's descriptions of Leighton Buzzard, Oxford, Charmouth and even Wimereux took me even further away. This may well account for the gap of nearly five years, after I had left school, before the next locality of note.

NORTH HARROW 2: A sewer trench through the London Clay, running east from Rayners Lane, gave a good section in the Basement Bed, at a point some 680 yards SSW of Hooking Green Bridge (Grid Ref. TQ 133882). On 8 March 1930 I noted 'fairly sandy clay', depth not given, on a 'pebble bed', on 'black sandy clay, unweathered'. One foot below the pebble bed, a line of claystones yielded a good fauna. Attached to the pebbles I noted 'Bryozoa'. These I showed to A. G. Davis and on 30 March I took him to the section; naturally he got much better material, eventually described as *Rhabdopleura eocenica* by Thomas & Davis, 1949, but from the London Clay at Lower Swanwick, Hampshire, only. No credit was given to H.A.T., nor is North Harrow 2 recorded in their Introduction (p. 3). Other material in the Museum: *Corbula* sp. (LL 14006, LL 14016), *Cyrtodaria rutupiensis* (LL 14022, LL 13997), *Lyonsia* sp. (LL 14020-14021), *Nemocardium plumsteadianum* (LL 14019), *Nucula fragilis* (LL 14000-14005), *Nuculana* cf. *prisca* (LL 14012-14016), *Panopea intermedia* (LL 13989-13991), *Pitar vaghiacrum* (LL 13994, LL 13998-13999), *Tellina* sp. (LL 13992-3, LL 13995-6, LL 14008, LL 14023), 'Bulla' sp. (GG 892-894), *Cochlespira gyrata* (GG 901-909), 'Epitonium' sp. (GG 911-912), *Euspira glaucinoides* (GG 888-891, GG 921-928), *Tornatellaea simulata* (GG 913-915).

HONEYPOT LANE: In December 1932 a sewer tunnel was dug below Honeypot Lane, 72ft below the summit of the hill (218ft O.D.), 1,000 yards S30°W of St Lawrence's Church, Whitechurch, Middlesex (Grid Ref. TQ 181905). In Wrigley's MSS the approximate height above the 'Basement Bed' is recorded as 36ft. The specimens were obtained from unweathered London Clay dumped near the 'Green Man' public house. I visited this locality twice only, once with Wrigley on 11 December and again on my own on 17 December when I collected a 'box full' of clay for washing, but the results were 'disappointing'. Material identified: *Arca tumescens* (LL 13754-13755), *Astarte* sp. (LL 13730-13739, LL 13740), *Corbula globosa* (LL 13751-13752), ?*Lyonsia* sp. (LL 13757), *Nuculana* sp. (LL 13741-13750), *Pholadomya* (juvenile) (LL 13756), ?*Pinnia affinis* (LL 13753), *Aporrhais sowerbyi* (GG 617-621), *Bartonia curta* (GG 630-631), *Cylichnina* sp. (GG 629), *Euspira glaucinoides* (GG 622-628), 'Siphonalia' sp. (GG 839), Turridae (GG 632-641, GG 643), *Jenkinsella apocynoides* Reid & Chandler 1933: 483, hollow locule cast, V. 23093.

The term 'London Clay Basement Bed' has been retained in the above account and in Table 1, in keeping with the historical context of the narrative. There seemed little point in substituting the later term 'Harefield Beds' and its later subdivisions, in that the sections are no longer available for inspection, and to the variance of stratigraphers' opinions as to its nature.

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[There was no Vol. 11. London Clay; CASIER 1966 could be regarded as its eventual equivalent – J.C.].

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TABLE 1. 'London Clay Basement Bed' localities and molluscan fauna

	Cannon Lane	North Harrow 1	North Harrow 2	Paines Lane
BIVALVIA				
<i>Amygdalum</i> [<i>Modiola</i>] <i>depressum</i> (J. Sowerby 1812)				×
<i>Arctica morrissi</i> (J. de C. Sowerby 1837 & 1841)		×		
<i>Arctopratalum</i> [<i>Nemocardium</i>] <i>plunsteadianum</i> (J. Sowerby 1813)			×	×
<i>Astarte subrugata</i> Wood 1871 [but probably <i>donacina</i> Wood 1871]		×		
<i>Astarte</i> sp.				×
<i>Corbula</i> sp.			×	×
<i>Cyrtodaria rutupiensis</i> (Morris 1852)	×		×	
<i>Glycymeris plunstediensis</i> (J. Sowerby 1813)		×		
<i>Lyonsia</i> sp.		×	×	
<i>Nucula fragilis</i> Deshayes 1834			×	
<i>Nuculana</i> cf. <i>prisca</i> (Deshayes 1860)			×	
<i>Panopea intermedia</i> (J. Sowerby 1814)		×	×	×
<i>Pitar vagniacarum</i> (Wrigley 1925)		×	×	
' <i>Tellina</i> ' sp.		×	×	
' <i>Teredo</i> ' sp.		×		
GASTROPODA				
<i>Aporrhais sowerbii</i> (Fleming 1828) (<i>sowerbii</i> Mantell 1829)	×	×		
<i>Bonelliitia</i> sp.		×		
' <i>Bulla</i> ' sp.		×	×	×
<i>Cochlespira gyrata</i> (Edwards 1857) (<i>Pleurotoma terebralis</i> var. <i>gyrata</i>)		×	×	
' <i>Epitonium</i> ' sp.			×	
<i>Euspira glaucinoides</i> (J. Sowerby 1812)			×	×
<i>Tornatellaea simulata</i> (Solander 1766)		×	×	
Turridae		×		×

TABLE 2. London Clay localities and mollusca fauna.

	Gerard Road	Honeypot Lane	Kingsbury
BIVALVIA			
<i>Abra splendens</i> (J. de C. Sowerby 1837)			×
' <i>Arca</i> ' <i>tumescens</i> Wood 1864		×	×
<i>Astarte</i> sp.		×	
<i>Corbula globosa</i> J. Sowerby 1818		×	
<i>Ledina</i> [<i>Nuculana</i>] <i>amygdaloides</i> (J. de C. Sowerby 1827)	×		×
<i>Lentipecten</i> [<i>Amusium</i> , <i>Pseudamusium</i>] <i>corneus</i> (J. Sowerby 1818)	×		×
? <i>Lyonsia</i> sp.		×	
<i>Nucula bowerbanki</i> J. de C. Sowerby 1837	×		×
<i>Nuculana oblata</i> (Wood 1864) (? a <i>Ledina</i>)	×		
<i>Nuculana</i> sp.		×	
' <i>Pecten</i> ' <i>duplicatus</i> (J. de C. Sowerby 1827)	×		×
<i>Pholadomya</i> sp., juvenile (probably a <i>Bucardiomya</i>)		×	
? <i>Pinna affinis</i> J. Sowerby 1821		×	
' <i>Pteria</i> ' <i>papyracea</i> (J. de C. Sowerby 1837)	×		×
<i>Thyasira angulata</i> (J. Sowerby 1821)			×
Tellinidae			×
GASTROPODA			
<i>Aporrhais sowerbii</i> (Fleming 1828)	×	×	
<i>Bartonia</i> [<i>Pisania</i> , <i>Pseudoneptunea</i>] <i>curta</i> (J. Sowerby 1818)		×	
<i>Cylichnina</i> sp.		×	
<i>Euspira glaucinoides</i> (J. Sowerby 1812)		×	×
<i>Euspira labellata</i> (Lamarck 1804)	×		
<i>Mambrinia</i> [<i>Galeodea</i>] <i>gallica</i> (Wrigley 1934)			×
<i>Sinum clathratum</i> (Gmelin 1791)			×
' <i>Siphonalia</i> ' sp.		×	
<i>Surculites velatus</i> Wrigley 1939			×
<i>Tornatellaea simulata</i> (Solander 1766)	×		×
Turridae		×	×
SCAPHOPODA			
<i>Antalis anceps</i> (J. de C. Sowerby 1837)			×
<i>Antalis</i> sp. [' <i>Dentalium</i> ' sp.]	×		×

Book Review

Early to Rise. A Sussex Boyhood. By Bob Copper. Javelin Books, London. 1988. 267pp. £4.99. ISBN 0 7137 2026 3.

This book is tightly packed with an enormous number of memories and reminiscences of Bob Copper's early years in the tiny hamlet of Rottingdean, from his birth in 1915 until the 1940s, when it began to change from an isolated, rural community, where 'any town from London to Leeds, from Oxford to Edinburgh, was referred to as being "somewhere up the back o' Lewes"', into the prosperous and highly populated seaside resort of today. The autobiography gives graphic and factual accounts of the wide variety of trades and skills practised by the local people, especially those connected with farming both land and sea, with the local habits and manners of speech recounted in racy dialogue.

The author's style is, however, rather abrupt; events sometimes appear to be recounted simply as they come to mind, or as they occurred chronologically, although there is some classification. Nevertheless, the factual account of so many lost arts (e.g. 'dollyng up', pumping the church organ) makes fascinating reading, and for the reader who is unwilling to struggle with the transcriptions of the local dialect, or who finds the sometimes lengthy anecdotes tedious, it is an easy matter to skip over these parts.

Bob Copper's family, living in the best of the 'upstreet' cottages, was not dragged down by poverty, and rarely went hungry or cold. His father, a vivacious, cheerful, enterprising man, with an especially close relationship with his son, was in permanent agricultural work and frequently brought home, legally or illegally, birds or rabbits to add to the homegrown vegetables for dinner. Entertainment also was provided by the father, with his frequent habit of bursting into song, or planning expeditions for Bob and himself. He had a very wide range of songs by heart, and many of them are reproduced in his son's autobiography with the melody line of the music and the full text of verses. Photographs of various members of the Copper family, and other villagers, engaged in rustic pursuits, included in the book, give an added interest, and the text is interspersed with occasional line drawings of rural scenes and buildings described.

This is a book for the leisurely reader rather than for the reader out to gather facts. There is no index, and no chapter headings, and with the rather random recounting, it is difficult to find any section one may wish to reread. One needs to be content to wander through the story of the author, aged four, almost being shot after being mistaken for a fox in chapter 3 after having absorbed details of the selling techniques and personalities of three of the regular travelling salesmen of the 1920s, with an unexpectedly added account of the local wandering eccentric, with a poem for every occasion, tagged on the end, in chapter 2. But the book is a fund of local information of its time – its songs, games, jokes, sayings, its demands of hard and rigorous labour in all seasons for both men and women of the country poor, and the slowness, quiet, and pondering of ways of life that are surely past for ever.

JANET LEYTHORNE

Group Feeding by Suburban Birds

by COLIN J. O. HARRISON*

Summary

Suburban gardens offer a relatively uniform habitat for birds in which dispersed feeding can occur. Regular provision of food at limited sites by humans leads to group feeding and the recognition by various species that such assemblages may indicate food availability. They may be misled by typically flock-feeding species such as starlings *Sturnus vulgaris*. Another type of group feeding may occur when individuals of the various smaller species present may assemble in a very small area but feed in their normal way on various food sources. This is interpreted as a response to the problem of disturbance by domestic mammals and humans, where birds already feeding may indicate that a site is safe and leads to a temporary feeding assemblage.

The outer suburbs of towns and of conurbations such as London often provide extensive areas of a specialised but relatively uniform habitat in the form of suburban gardens within which the rows of houses are set. The present observations have been based on an area of the northern side of Harrow towards the north-western edge of the Greater London area. Here the habitat consists of two-storey houses in continuous rows or rows of semi-detached pairs, with garden plots of about 6×16 to 10×31 metres, and often a small strip about 4.5 metres wide in front, bordering the pavement.

The plots tend to be bordered by fences, hedges, taller shrubs and trees, surrounding an area of open grass lawn and paths, and cultivated soil with spaced or grouped annual and perennial plants. The current fashion is for an increasing amount and variety of shrubs and small trees. Large trees are scarce and well-spaced, while shrubs and trees are pruned and rarely allowed to grow close and thick enough to form continuous thickets.

The distribution of vegetation is such that plants and their attendant insects as food sources are fairly evenly dispersed in a way that should result in feeding individuals of the limited range of bird species being scattered through the garden habitat. However, there appear to be at least two factors that lead to a grouping of feeding birds at times.

The more usual of these is the provision of food at a single source when birds are fed by householders. This may be provided at feeding-stations such as bird-tables, usually on a sustained basis, and these might be regarded as permanent nucleated for-sources at intervals through the habitat. A more frequent alternative is fairly large quantities of food, mostly bread but also including other waste foods, that are scattered broadcast on a lawn or flower-bed.

These latter sources immediately attract large numbers of the two commonest species, starlings *Sturnus vulgaris* and house sparrows *Passer domesticus*. Both feed actively and aggressively. In the starlings this is accompanied by sharp shrill calls and fluttering squabbles. Other birds may be attracted, in particular blackbirds *Turdus merula*. Both sparrows and starlings attempt to take advantage of these melées by carrying off the larger pieces of food to a little distance where they may feed without competition. This may involve moving to another garden or a roof-top. This attracts more species. Carrion crows *Corvus corone*, and in winter black-headed gulls *Larus ridibundus* may be present, but both are reluctant to settle in the enclosed gardens although hunger may induce them to briefly visit barer and more open ones. However, they frequently wait on roof-tops and attempt to rob smaller birds carrying away food items.

Many birds tend to respond to the sight of another feeding, but in places where quantities of food are provided at limited sites, this response seems to be enhanced and more widespread. In particular, where small groups of starlings begin feeding by probing a lawn for insects, house sparrows usually rapidly appear and hop around them in a manner suggesting that they anticipated food to be available and are at a loss when they cannot see it. Blackbirds and chaffinches *Fringilla coelebs* may show similar behaviour in such circumstances, but to a lesser extent. While a rapid response to food sources indicated by other birds could be advantageous to an individual, too much time wasted on occasions when apparent food sources turned out to offer nothing could be dangerous.

The second factor that leads to grouping of feeding birds is less immediately obvious. It may occur at any time of year, although more frequent outside the breeding season. It manifests itself as an assemblage of usually small numbers of a variety of species feeding in a surprisingly limited area and seemingly ignoring similar areas surrounding it. These groups often appear to include most of the smaller species present within the general locality.

One group noted included house sparrow, starling, blackbird, greenfinch *Carduelis chloris*, dunnoek *Prunella modularis* and blue tit *Parus caeruleus*, all feeding within a space of about five metres square, with no others evident in the immediately surrounding gardens. They were feeding in close proximity to each other but with some in shrubs or plants, others on the ground.

The most striking aspect of this behaviour is that within the limited space the species feed in typical fashion utilising different plant and insect sources, and not behaving as though any one source was more important. There is no suggestion that they are sharing a food source and in this respect it does not resemble most types of flock feeding. It might bear some resemblance to the mixed bird flocks of tropical forests or winter associations of tits and other arboreal species; but the assemblage is only temporary and the birds do not move as a group, but disperse after feeding.

The birds involved appear to confine themselves for feeding to a small part of an extensive habitat, not differing in any obvious way from other areas. Since they do not appear to be attracted by a particular food source there must be some other reason for their association. Temporary freedom from disturbance seems the likeliest explanation. Although in theory they could feed as more dispersed individuals they are then likely to suffer from a fairly high degree of disturbance.

Both dogs and cats are present and although they spend much of their time in houses they constantly use the gardens. Dogs do not appear to regard the birds as potential prey, but are likely to casually disturb them or chase them for amusement. Cats are constant predators, hiding among plants and catching birds. In the area under observation there was about one dog to twenty or thirty houses, but a cat to about every three, creating a rather high level of visible diurnal predators and disturbers. In addition, although birds such as house sparrows and blackbirds become very tame and will approach and feed close to a person sitting in a garden; they and other species are reluctant to feed in the presence of moving humans.

Confronted with this amount of potential disturbance, birds may face a problem in feeding and must presumably be on the watch for undisturbed gardens when they wish to feed at or near ground level. The presence of one or two birds already feeding would indicate a temporarily safe place, with the safest area near the feeding individuals. The relative uniformity of habitat would make it likely that suitable feeding would be available near the birds already present. This would facilitate the temporary build-up of varied species feeding on different foods in a very circumscribed area.

Hedgerows Surviving in Willesden

by L. R. WILLIAMS* and JANE SMITH

Summary

A survey of agricultural hedgerows and their remnants surviving in the now urban parish of Willesden in north-west London found 176 standard (timber) trees and 2.4 kilometres of hedgerow representing 97 hedgerows. Most of the standard trees were oak *Quercus robur*. The results are discussed in relation to the urbanisation of the parish.

Introduction

A previous paper (Williams, McLauchlin and Harrison 1987) described the results of a survey of surviving agricultural hedgerows in the parish of Kingsbury, a now suburban area of the London Borough of Brent. During 1987 this survey was extended to the parish of Willesden, also in Brent, but a more urban area than Kingsbury. Willesden lies between approximately seven and fourteen kilometres north-west of St Paul's Cathedral and is almost entirely on London Clay.

For the purposes of this survey, Willesden was taken as that area of the former parish which is within the present-day London Borough of Brent, i.e. the former parish and a few minor additions to the west. Willesden is a triangular area bounded to the west and north by the River Brent, to the east by the Edgware Road; and to the south by the former parishes of Paddington, Kensington, Hammersmith and Acton. Thus the survey area was about 1,875 hectares, much of which could be described as inner-city. There do not appear to have been any previous comprehensive surveys of former agricultural hedgerows in inner-city areas.

Methods

The same method was used as for the Kingsbury survey and as described by Williams and McLauchlin (in press). Hedgerows and standard (timber) sized trees were only recorded if their position corresponded with hedges or field boundaries shown on maps dating from a period when the area was still rural: for example the six-inch to the mile (9.5cm to the kilometre) Ordnance Survey maps and the Inclosure Award map of 1816. Lengths of surviving hedgerow and of any associated earthworks were estimated by pacing. Scientific names follow Clapham, Tutin and Moore (1987).

Results

Ninety-seven former agricultural hedgerows or their remnants were found in Willesden. A duplicate of the data on each hedge has been deposited with Wembley History Society. There were a total of 176 standard hedgerow trees. Oak, mainly *Quercus robur* but possibly including other oak species, accounted for 139 of these, 18 were of ash *Fraxinus excelsior*, nine of crack willow *Salix fragilis* (in a hedge alongside the River Brent), three were of an unidentified willow *Salix* species, there were three field maple *Acer campestre*, two horse chestnut *Aesculus hippocastanum* and two common lime *Tilia × vulgaris*. There were also three dead oaks. Half (88) of the standard trees were in the north-east of Willesden in the vicinity of Dollis Hill and Gladstone Park.

Surviving hedgerow totalled an estimated 2,432 metres in length including 550 metres by the River Brent, but excluding 1,159 metres of 20th century hedge alongside Coronation Road in the Park Royal area. Oak, mainly *Quercus robur* was recorded in 66 of the 97 hedges, English elm *Ulmus procera* in 33, elder

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Sambucus nigra in 26, sycamore *Acer pseudoplatanus* in 21, common hawthorn *Crataegus monogyna* in 18, ash *Fraxinus excelsior* in 17, hybrid hawthorns *Crataegus* $\times$ *media* in 12, field maple *Acer campestre* in six; horse chestnut *Aesculus hippocastanum*, garden privet *Ligustrum ovalifolium* and willow *Salix* spp. in five hedges each; holly *Ilex aquifolium* and blackthorn *Prunus spinosa* in three hedges; wild rose *Rosa* spp. and common lime *Tilia* $\times$ *vulgaris* in two hedges; and the following species were recorded in one hedge each; dogwood *Cornus* spp., unidentified hawthorn *Crataegus* spp., woodland hawthorn *C. laevigata*, mulberry *Morus nigra*, crack willow *Salix fragilis*, Swedish whitebeam *Sorbus intermedia* and yew *Taxus baccata*.

There were 689 metres of earthwork, mainly river embankment, but including 139 metres of hedgerow bank and ditch.

The Urbanisation of Willesden

This account describes how Willesden developed from a rural parish to an urban conurbation. Sources include Bolton (1982), Morris (1950) and Winterburn (1977).

At the time of the Domesday Survey in 1086, Willesden was assessed for 20.5 ploughs and enough woodland for 750 pigs. Rackham (1980) has provided estimations for interpreting Domesday records based on one plough representing about 48.6 hectares of cultivated land and each pig representing a minimum of 0.41 hectares of woodland. For Willesden this suggests 1,000 hectares under cultivation and an area of woodland in the range of 300 to possibly over 500 hectares. These estimates give a reasonable agreement with the original parish area of 1,773 hectares and suggest that about two-thirds of the parish area had been cleared for agriculture. A map produced by All Souls College, Oxford in 1599, shows some extant woodland. It is probable that the settlement pattern of small hamlets in this rural parish changed little until the early 19th century. The population of the parish was 751 in 1800. The Inclosure Award map of 1816 depicts a farmed landscape with a few areas of common land, but no woodland as such.

By 1851 the population had increased to about 3,000 and to 3,871 in 1861. The first railway through Willesden, the Euston line of the London and Birmingham, was followed by the Hampstead Junction Railway (now the North London link) and Willesden Junction station was built in 1866. Housing developed around the station and for wealthy commuters, at Stonebridge Park. The Cricklewood to Acton line of the Midland and South Western Junction Railway opened in 1875. Willesden rapidly became a dormitory town for workers who travelled to London by train or bus. Kilburn's population had risen to 12,000 out of a Willesden total of 18,559 by 1875. The Metropolitan Railway was extended in 1879 with stations at Kilburn, Willesden Green and later at Neasden. The population doubled to 38,000 in 1885 and doubled again by 1895 to reach 79,260.

Though there was an arc of development from Kilburn through Brondesbury, Willesden Green, Church End, Stonebridge Park, Harlesden and Kensal Green, much of the centre of the parish and the area north of the Metropolitan Railway was still grassland and remained agricultural even in 1908 when the population reached 144,785. The first factory had been built in the 1890s. During the 1914-18 war munitions factories were built on the Royal Agricultural Showground and these later turned to light industry. In 1921 when the construction of the North Circular Road began there were still 647 hectares of undeveloped land in Willesden, mostly in the north. More factories followed and housing estates were built at Dollis Hill and Neasden. The population reached 172,000 in 1925 and peaked at over 198,000 in 1939, when there were 461 industrial firms in the Borough of Willesden.

Willesden was now an urban area with little undeveloped land, other than the public parks and open spaces. The infrastructure suffered heavily during the

Second World War and over 60,000 people moved away, though the population had increased again to 189,202 by 1948. Since then, some areas such as South Kilburn have been entirely redeveloped, but many of the housing problems have remained and new social problems have arisen. Today, Willesden has a population of about 130,000. Dollis Hill and the Brondesbury Park area have retained their suburban character, but much of Willesden can be described as inner-city with high density pre- and post-war housing, large industrial areas and many railway lines.

Discussion

Although this method for tracing former agricultural hedgerows was devised for use in suburban areas (Williams and McLauchlin in press), these results show that it can also be used in urban areas. Furthermore, the method is not limited to suburbia built since the 1920s, but can be applied where development commenced in the late 19th century, though with more difficulty. High building densities reduced survey access and made it difficult to compare the position of standard trees with that of hedgerows shown on the 19th century maps. This was especially a problem following urban redevelopment schemes and in these locations it was unusual to find any surviving hedges. A further source of confusion was the large number of old garden and urban park trees that had been planted in the 19th century or early 20th century and had now grown to standard size. Hence the importance of checking the results against the map evidence and on which it is clear that building estates often followed the outline of the former field boundaries, an observation also noted by Morris (1950).

As expected, less surviving hedgerow was found than in suburban Kingsbury, a parish of only 744 hectares but with 14,490 metres of hedge and 524 standard trees. In Willesden, much of the hedgerow and standard trees were located in the suburban Dollis Hill, Gladstone Park and Brondesbury Park areas. Simms (1962) mentioned the value of some of these standard trees, then including English elms, to the bird-life of Dollis Hill.

Despite these changes from an agricultural parish to an industrial inner-city part of the London conurbation, Willesden still has over two kilometres of hedgerow and 176 standard hedgerow trees which must contribute to the wildlife habitat in this urban environment.

Acknowledgements

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Book Review

Butterflies of the London Area. By Colin W. Plant. 199pp., many colour illustrations, 42 maps. London Natural History Society. 1987. £15.95. ISBN 0-901009-03-2.

This is a very comprehensive account of the butterflies of the London area, well bound and with text and plates clearly printed on good quality paper. After a brief foreword and preface there follows a most interesting and well researched chapter on the history of butterflies and butterfly recording in the London area. There are then accounts on the current situation, geology, habitats, conservation, collecting, introductions and attracting butterflies to gardens, plus notes on useful addresses and suggestions of further reading. The opinions put forward under the collecting and introductions headings are particularly sound.

The bulk of the book is taken up with the species accounts and distribution maps. Under each species heading is found details of present status, past history, life-cycle, times of appearance and notes on identification and other points of interest. It is nice to see the writer referring to food plants on which he personally has recorded each species feeding upon rather just slavishly following the standard textbooks. The style of writing is not as a quick reference book but of one in which the reader should browse and digest at leisure, a style that the reviewer found most agreeable.

Grouped together toward the end of the book are the distribution maps, one map per page, the distribution being plotted on the now conventional tetrad basis. All the maps show clearly the pattern of distribution within the area and one shudders at the effort and time that must have gone into proving that the small tortoiseshell was common throughout by obtaining records from every tetrad. The book is concluded with a very clear index.

However all is not perfect and there are a number of minor printing mistakes, notable among these is the statement that the Essex skipper was added to the British list in 1988! Two sets of transposed photographs are rather unfortunate and although there is an adhesive erratum slip opposite the title page (who looks there?) it would have been more effective, although more time consuming, to have put errata slips actually with the respective photographs. The omission of the ringlet map is regrettable as this always appears to have a complicated distribution throughout the whole of its range, and even more so as there is a blank page where this map should have been at the end of the other maps. On a personal note, and particularly as the 'London Area' covers parts of seven vice-counties, the reviewer found it difficult to relate to the unique citation of individual tetrads and would suggest that the L.N.H.S. should consider falling into line with the citation as used by the B.S.B.I. and most other county recorders.

In spite of the few minor shortcomings this is a book that should be on the shelf of every butterfly enthusiast in this country and every other naturalist living in south-east England.

ERIC G. PHILP

Grasslands on Barn Hill and Horsenden Hill, Middlesex

by L. R. WILLIAMS* and NICK BERTRAND**

Summary

A preliminary survey of grasslands was undertaken on Barn Hill and Horsenden Hill, which rise from the London Clay basin of Middlesex and are capped by various gravels. The two hills appeared to have similar floras and these were probably characteristic of formerly more extensive grassland communities on the lowland hills of north-west Middlesex. Barn Hill and Horsenden Hill are now managed for public recreation and wildlife conservation by the London Boroughs of Brent and Ealing respectively.

Introduction

Only in recent years has any serious attempt been made to study grasslands on the London clay of north-west Middlesex and adjacent areas. Many of these grasslands were lost during the expansion of London earlier this century, while in Hertfordshire and Essex grasslands were lost through agricultural improvements. The floral interest of the surviving grasslands in north-west London has been recognised by the London Ecology Unit (Hare 1988). Other published literature on these grasslands is confined largely to Kent (1974), Burton (1983), an account of pasture at Perivale Wood Nature Reserve (Roberts and Edwards 1974), a survey of the Fryent Country Park hay meadows (Williams 1986) and the flora of Totteridge (Griffith 1986). The aims of this study were to survey the grasslands on Barn Hill (summit at TQ193874) and on Horsenden Hill (summit at TQ162844), just over four kilometres to the south-west.

Barn Hill, now part of Fryent Country Park, rises to 86 metres Ordnance Datum. On the summit the London Clay is capped by pebble gravel; and varying quantities of downwash gravels and sands cover the slopes. Little historical information is available on the past land use, though an account of the hedgerows adjacent to the hill grasslands has been given by Williams and Cunningham (1985). It is not known when the original woodland was cleared, but Barn Hill had probably been farmland for some centuries before the summit and lower slopes were landscaped by Humphry Repton in 1793 (Williams, Cunningham and Hewlett 1985). In 1817 Coneyvale was classified as pasture, while in 1852 both this field and Saltcroft were listed as meadowland. There was a private golf course on Barn Hill from about 1895 to the 1920s, after which it became public open space. This evidence suggests a long history as grassland in one form or another.

Horsenden Hill rises to 84 metres above sea level and the grasslands under consideration in this paper are those that occur on the hill itself, above 50 metres O.D., rather than those of the lower lying meadows. The hill is capped by Claygate Beds and then by pebble gravel with downwash material over the London clay. Dr H. A. Sandford has found evidence in the downwash that this hill was once capped by Bagshot Sands (R. M. Burton, pers. comm. and Burton 1983). However, the geology of Horsenden Hill is complicated and no completely satisfactory accounts exists in the literature. As for Barn Hill, little historical information on when the woodland was cleared is available, but it is almost certain that Home Mead, Long Mead and Well Field were meadow long before they were recorded as such on the Binfield map of 1775. Local residents recall stock being grazed on the hill grasslands both before and after the Second World

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War; and until the 1950s when grazing ceased. In the 1930s most of Well Field was transformed into part of a golf course. Hill Rise was woodland until 1833, when it was clear felled, after which this field was used for pasture. In more recent times Hill Rise was bulldozed to ease mowing, but it has not been cut since mowing ceased in 1985. Further information is given by the London Borough of Ealing (1985*a* and 1985*b*).

Since the suburban expansion of the 1920-30s, both hills have been managed for public recreation. Recent management has recognised their wildlife interest. Barn Hill is now managed as part of Fryent Country Park by the London Borough of Brent (Brent Leisure Services) and Horsenden Hill as part of the larger and eponymous open space by the London Borough of Ealing (Leisure Services Division). On both hills the grasslands are no longer grazed and traditional forms of management have been neglected for some decades, thus allowing considerable scrub invasion.

Methods

From initial visits it was apparent that the two hills had a variety of grassland communities merging with the adjacent habitats and invading scrub. A preliminary description of the grassland was required and it would have been impractical to have attempted to describe uniform communities in the fashion of Braun-Blanquet (Poore 1955-56). A one square metre quadrat, the standard size for grassland surveying (Smith, Wells and Welsh 1985), was thrown at random at ten locations in each field. Two scales were employed. The number of quadrats in which each species was found gave a frequency of occurrence, as used in the Fryent Country Park hay meadow survey (Williams 1986) and described by Duffey (1974). Secondly, the ACFOR scale was used which is suitable for initial descriptions of vegetation (Sandford 1968). Estimations were made of the cover-abundance of species in each quadrat, where Rare = less than 5% of ground cover, Occasional = 5-25%, Frequent = 25-50%, Common = 50-75% and Abundant is more than 75% of ground cover. Since it would have been inappropriate to reproduce all the data in Table 1, an average for each species was obtained from the sum of the rating mid-points, e.g. if a species occurred in two quadrats in a field with ratings of rare (mid-point 2.5%) and occasional (mid-point 15%), then the cover-abundance of that species over the ten quadrats would be taken as 1.75%, or rare in Table 1. As a further check on the reliability of these methods, the survey was repeated in Home Mead, one of the Horsenden Hill fields; and the two sets of data can be compared in Table 1. Species not found in any of the quadrats but present elsewhere in the field were noted.

The survey was undertaken in 1987, though some species records were made in previous years.

Results

Four fields were surveyed on Horsenden Hill: a 0.25 hectare remnant of Well Field on the south-east slopes, Long Mead (2 ha) and Home Mead (3 ha) on the south-west slopes, and Hill Rise (2.5 ha) to the north-west. At Barn Hill, the fields of Saltcroft on the east side of the hill (6.5 ha of which about 4.5 hectares was of grassland and scrub), and the adjacent Coneyvale on the north-western slopes (5 ha of which about 4 ha was of grassland and scrub). Similar grasslands occurred at other locations on the two hills, especially at Horsenden Hill and at Bardonhill on the summit plateau of Barn Hill, but it was not practical to survey these often fragmented remnants. The results are given in Table 1, the order of which follows Clapham, Tutin and Moore (1987).

At Barn Hill and to a lesser extent at Horsenden Hill there has been considerable scrub invasion from adjacent hedgerows and woodland; and from trees growing in the unmanaged grassland. The more common of these scrub

species were oak, mainly *Quercus robur*, bramble *Rubus fruticosus* agg., hawthorns mainly *Crataegus monogyna* and *C. × media*, though one in Home Mead had characteristics near to *C. laevigata*; and English elm *Ulmus procera*. Other scrub species present at both hills were wild rose *Rosa* spp., blackthorn *Prunus spinosa*, silver birch *Betula pendula*, hornbeam *Carpinus betulus*, willow *Salix* spp., ash *Fraxinus excelsior* and elder *Sambucus nigra*. Other Barn Hill scrub species were yew *Taxus baccata*, sycamore *Acer pseudoplatanus*, field maple *A. campestre*, horse chestnut *Aesculus hippocastanum*, holly *Ilex aquifolium*, rowan *Sorbus aucuparia*, whitebeam *S. aria*, beech *Fagus sylvatica* and garden privet *Ligustrum ovalifolium*. Wild service tree *Sorbus torminalis* and a small butcher's broom *Ruscus aculeatus* were found in Saltcroft. Gorse *Ulex europaeus* and broom *Cytisus scoparius* grew in the Coneyvale grassland.

Some species were found more often in the scrub edge communities, rather than as true grassland species. At Horsenden Hill these were red campion *Silene dioica*, greater stitchwort *Stellaria holostea*, white bryony *Bryonia dioica* and hedge woundwort *Stachys sylvatica*; and at Barn Hill, bracken *Pteridium aquilinum*, buckler fern *Dryopteris dilatata*, creeping jenny *Lysimachia nummularia*, larger bindweed *Calystegia sepium* and black bryony *Tamus communis* from Saltcroft; white dead-nettle *Lamium album* from Coneyvale; and honeysuckle *Lonicera periclymenum* from both Coneyvale and Saltcroft.

A ditch in Saltcroft contained pendulous sedge *Carex pendula* and yellow flag *Iris pseudacorus*. Oval sedge *Carex ovalis* was recorded in a part of Coneyvale which is mown for recreational use. Additional species in the hill grasslands at Horsenden Hill included common horsetail *Equisetum arvense*, grass vetchling *Lathyrus nissolia*, common restharrow *Ononis repens*, common centaury *Centaurium erythraea* and red bartsia *Odontites verna*.

Discussion

Some of the problems of selecting an appropriate survey method for such varied grassland-scrub habitats were mentioned in Methods. For example, at Saltcroft on Barn Hill, the once continuous grassland was scattered amongst a large number of glades and along footpaths. This presented problems regarding the placing of the quadrats and their distance from the extensive areas of grassland-scrub edge habitat. Often, small areas with concentrations of old grassland species were surrounded by larger areas of less interesting grassland. At Well Field, Horsenden Hill however, only the surviving old grassland remnant was surveyed and not the remaining 1.5 ha which is now part of a golf course. In retrospect, it may have been better to have estimated the numerical percentage cover directly for each quadrat, rather than to have used the ACFOR scale which has very wide rating scales. In the grassland quadrats under consideration, the vast majority of species were recorded as either rare or occasional, which disguises large differences in actual abundance.

Well Field, Long Mead and Home Mead at Horsenden Hill and Saltcroft at Barn Hill can be described as neutral grassland. These were the lower fields on the two hills and with pH ranges between 5-6, as measured with laboratory pH paper.

Hill Rise at Horsenden Hill and Coneyvale at Barn Hill had similar floras, which differed from those of the four fields listed above. Both fields were near to their respective hill summits, had greater slopes than the other fields and appeared to be on the gravel or gravel downwash, rather than on the London Clay of the lower fields. At both fields bent grasses *Agrostis* spp. and red fescue *Festuca rubra* were the dominant grasses with much Yorkshire fog *Holcus lanatus*, sheep's sorrel *Rumex acetosella*; and additionally at Coneyvale creeping soft grass *Holcus mollis*. This is similar to the grass heath communities of lowland England described by Tansley (1939) and is a very variable habitat. Many of the other less frequent species recorded in these two fields prefer acidic conditions and were also included in the floristic list for grass heath by Tansley (1939). At both fields

the soil pH was often found to be as low as 4.5. At Coneyvale, Barn Hill a pH of 4.0 was recorded in the vicinity of a colony of *Polytrichum commune*, a rare moss in Middlesex (Kent 1974) and an indicator of acid soils. Heath grass *Danthonia decumbens* was discovered in Hill Rise, Horsenden Hill during the survey and early hairgrass *Aira praecox* has been recorded at Barn Hill by Kent (1974).

Management of these grasslands is difficult, due to the scrub encroachment mentioned above and to the considerable recreational pressure. Grazing is impractical. Cutting for hay is not only difficult due to the slope and the large number of obstacles such as trees and earthworks, but would also destroy the many ant hills which add to the wildlife interest of these grasslands. At both hills present management involves manual control of scrub and at Horsenden Hill some grassland areas are cut back each year. Bramble control is very difficult. Trials of various grassland and scrub management methods are being studied and further suggestions would be welcome.

The grasslands of these two hills appear to be remnants of a formerly extensive grassland area which covered the Brent basin of north-west Middlesex and beyond (Kent 1974). Neutral grassland covered much of this London Clay country and grass heath communities may have occupied the gravel capped hills and other sandy deposits. There are other sites, for example in the London Borough of Ealing which also have hill grasslands. The flora of the two hills listed in Table 1, includes species characteristic of old grassland that are now rare in Middlesex. Both Fryent Country Park and Horsenden Hill have other grasslands including large areas of hay meadow. Together with their hill grasslands these sites are considered to be of Metropolitan Importance for nature conservation in London (Hare 1988). These grasslands will need careful management to conserve their increasingly rare and interesting flora.

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TABLE 1. Grassland flora on Barn Hill and Horsenden Hill, Middlesex. Note that the numerical figures refer to the frequency of occurrence and the ACFOR ratings to cover-abundance as mentioned in the text. Species recorded outside of the quadrats are designated by *. It is possible that some species have been under-recorded. The two columns for Home Mead refer to the original and a repeat survey as described in the text.

	Horsenden Hill				Barn Hill		
	Well Field	Long Mead	Home Mead	Hill Rise	Coney- vale	Salt- croft	
Survey date (all 1987)	15.8	29.8	15.8	31.8	26.8	23.8	22.8
<i>Ophioglossum vulgatum</i>							*
<i>Ranunculus acris</i>	2 R		3 R	*		1 R	*
<i>Ranunculus repens</i>	4 R	4 O	2 R	2 R	1 R	*	4 O
<i>Ranunculus ficaria</i>		*	*	*			*
<i>Capsella bursa-pastoris</i>			paths	paths			
<i>Cardamine pratensis</i>	*						
<i>Reseda luteola</i>			paths	paths			
<i>Cerastium fontanum</i>	1 R	1 R	1 R	3 R			*
<i>Stellaria media</i>							1985
<i>Stellaria graminea</i>	1 R	*	2 R	*	*		1 R
<i>Genista tinctoria</i>		*	1 R	*			
<i>Vicia tetrasperma</i>							*
<i>Vicia sativa</i>			1 R	*			*
<i>Lathyrus pratensis</i>		2 R	*	2 R			*
<i>Trifolium repens</i>	1 R	1 R	*	2 R	*	paths	1 R
<i>Trifolium dubium</i>			*	*			
<i>Trifolium pratense</i>	*	*	*	*	*	*	*
<i>Trifolium medium</i>			*	*			
<i>Lotus corniculatus</i>	2 R		*	*	*	*	*
<i>Lotus uliginosus</i>	2 R		*	*		*	*
<i>Rubus fruticosus</i> agg.	4 O	1 R	*	*	*	1 R	*
<i>Potentilla erecta</i>					*		
<i>Potentilla reptans</i>	*	*	*	*		*	2 R
<i>Agrimonia eupatoria</i>	1 R	*	1 R	1 R			*
<i>Crataegus</i> spp.	1 R	*	1 R	*		*	*
<i>Epilobium hirsutum</i>	*	*	*	*			*
<i>Chamaenerion angustifolium</i>	2 R	*	*	1 R		1 R	3 O
<i>Anthriscus sylvestris</i>	4 R	3 R	3 R	4 R	*	*	*
<i>Conopodium majus</i>						*	*
<i>Pimpinella saxifraga</i>	2 R	2 O	6 O	5 O		*	*
<i>Silaum silaus</i>	4 R		1 R	*			*
<i>Heracleum sphondylium</i>	8 O	3 R	2 R	*			*
<i>Polygonum aviculare</i> agg.		paths	paths	paths	paths	paths	paths
<i>Polygonum persicaria</i>						*	
<i>Rumex acetosella</i>			*	*	5 O	5 O	1 R
<i>Rumex acetosa</i>	5 R	4 R	5 R	6 R	*	2 R	1 R
<i>Rumex obtusifolius</i>		*				*	
<i>Rumex sanguineus</i>	*	*					ditch
<i>Urtica dioica</i>			*	*	*		*
<i>Quercus robur</i>		*	2 R	2 R	*	6 R	1 R
<i>Fraxinus excelsior</i>	2 R						*
<i>Convolvulus arvensis</i>			5 O	3 R			
<i>Solanum dulcamara</i>			*	*			*
<i>Scrophularia nodosa</i>							*
<i>Prunella vulgaris</i>	2 R	*					
<i>Stachys officinalis</i>							*

	Horsenden Hill				Barn Hill	
	Well Field	Long Mead	Home Mead	Hill Rise	Coney- vale	Salt- croft
<i>Galeopsis tetrahit</i>					*	*
<i>Glechoma hederacea</i>			1 R	*		
<i>Ajuga reptans</i>	3 O					*
<i>Plantago major</i>	paths		paths	paths	paths	paths
<i>Plantago lanceolata</i>			paths	paths		
<i>Galium verum</i>	*		*	*	1982	
<i>Galium aparine</i>			*	*		*
<i>Succisa pratensis</i>	*				*	*
<i>Senecio jacobaea</i>						*
<i>Senecio erucifolius</i>	*	1 R	1 R	2 R		*
<i>Senecio sylvaticus</i>					*	*
<i>Gnaphalium uliginosum</i>					paths	
<i>Solidago canadensis</i>		*				
<i>Aster</i> spp.			*	*		*
<i>Achillea ptarmica</i>						*
<i>Achillea millefolium</i>	2 R	4 O	6 O	6 R	1 R	2 R
<i>Tripleurospermum inodorum</i>			paths	paths		
<i>Matricaria matricarioides</i>			paths	paths	paths	
<i>Artemisia vulgaris</i>			*	1 R	paths	*
<i>Cirsium vulgare</i>		*	*	*		*
<i>Cirsium palustre</i>						*
<i>Cirsium arvense</i>	5 R	5 O	6 O	2 R	*	6 O
<i>Centaurea nigra</i>	10 F	3 R	4 O	7 O	*	*
<i>Hypochoeris radicata</i>		*	*	*	*	1 R
<i>Leontodon autumnalis</i>		*	*	*	*	*
<i>Leontodon taraxacoides</i>	*					
<i>Tragopogon pratensis</i>			1 R	*		*
<i>Lactuca serriola</i>			*	*		
<i>Sonchus arvensis</i>		*	*	*		
<i>Sonchus asper</i>		*	*	*		
<i>Hieracium</i> spp.		*	*	*		
<i>Taraxacum</i> spp.		*	1 R	*		*
<i>Juncus inflexus</i>					*	
<i>Juncus effusus</i>					*	*
<i>Juncus conglomeratus</i>					*	*
<i>Juncus bufonius</i> group					*	
<i>Luzula campestris</i>					paths	*
<i>Carex hirta</i>					*	2 O
<i>Carex flacca</i>						*
<i>Festuca pratensis</i>			*	*		*
<i>Festuca rubra</i>	2 R	1 R	3 R	6 O	10 A	8 F
× <i>Festulolium holiaceum</i>			*	*		5 O
<i>Lolium perenne</i>	paths	*	2 R	*	*	paths
<i>Poa annua</i>		paths	paths	paths	paths	*
<i>Poa pratensis</i>						*
<i>Dactylis glomerata</i>	8 O	7 O	8 O	6 O	*	1 R
<i>Cynosurus cristatus</i>	paths					
<i>Elymus repens</i>		1 R	*	3 R		*
<i>Hordeum secalinum</i>			*	*		
<i>Hordeum murinum</i>					paths	
<i>Arrhenatherum elatius</i>	8 O	10 O	10 O	10 F	*	7 O
<i>Trisetum flavescens</i>					*	*
<i>Deschampsia cespitosa</i>		*	1 R	2 O	1 R	8 O
<i>Anthoxanthum odoratum</i>	1 R	*	*	*	*	*
<i>Holcus lanatus</i>	8 O	10 O	10 O	10 O	4 O	6 O
<i>Holcus mollis</i>						3 O
<i>Agrostis</i> spp.	8 O	10 O	7 O	6 O	10 O	9 F
<i>Phleum pratense</i>						*
<i>Phleum bertolonii</i>	3 R	1 R	*	*	*	*
<i>Alopecurus pratensis</i>	2 R	1 R	3 R	2 R	*	1 R
<i>Alopecurus geniculatus</i>						4 R
<i>Danthonia decumbens</i>					*	*

Book Review

Butterflies of the World. By Rod and Ken Preston-Mafham. Blandford Press, London, 1988. 192pp. £14.95. ISBN 0 7137 1884 6.

This is the sixth book in a series of 'of the world' publications from Blandford, and the second to be authored by the Preston-Mafhams; their first concerned spiders. The remaining four subjects covered being insects, snakes, frogs and toads and sharks. The last work was reviewed in *The London Naturalist* 65 by Bernice Brewster.

It has to be confessed that the reviewer's initial reaction (before reading), to yet another butterfly book – even worse, one claiming to cover the entire world – was not favourable. How can anyone possibly cover the entire world's butterfly fauna in a single small volume? It was therefore with considerable relief that I discovered from reading the preface that the authors were of the same opinion! To use their own words 'It is sadly inevitable that an enormous amount of relevant information has had to be omitted, simply on grounds of space, and we have therefore been forced to be very selective in choosing the material for presentation.' They are to be praised for this attitude and for not falling into the trap, which catches so many authors, of trying to include a little bit of everything! Happily, a high degree of success has been achieved in deciding what to leave out, and the Preston-Mafhams have compensated for the inevitable loss of already widely known factual information by including a great many personal observations, often of an anecdotal nature. I strongly recommend reading the Preface before the rest of the book is tackled. The introductory chapter is short and concise, covering classification and relationship to other invertebrates. More detailed chapters on structure, life-cycles, adult behaviour, survival and variation make up the remainder of the book with concluding chapters on ecology and distribution and butterflies and man. Taken together these chapters admirably cover most aspects of the structure, form and function of butterflies as a group in a clear, concise manner. The book is neither high faluting nor patronisingly simple but achieves a balance which makes it a useful textbook for the student of entomology whilst also being the sort of book that a person in any way interested in natural history could sit down and read over a cup of tea.

The illustrative content, however, deserves the higher praise. A small number of line drawings are included in the chapters on structure and life cycles; these are clear and useful. Eighty-one four-colour plates and thirty-eight monochromes are all of the highest possible photographic standard and are also reproduced by the printer with a high degree of accuracy of colour. None of the photographs, it is claimed, has ever been published before.

The inevitable glossary is very short and probably unnecessary; most words here defined could have been better dealt with in the text as has been the case with many other words included in the chapter on structure but absent from the glossary. The inclusion of three appendices entitled 'Butterflies observed on a small piece of predator dung in Kakamega Forest, Kenya', 'Butterflies attracted to urine soaked ground in Kakamega Forest, Kenya over a period of five days' and 'Butterflies on bare earth behind a hut in Tingo Maria, Peru' seems rather pointless without an explanation of the behaviour observed, particularly since the book is clearly aimed at a general readership. The now customary, but never the less useful, 'Guide to further reading' and list of butterfly conservation societies (they list two – B.B.C.S. and Xerecs), follow. The reviewer knows from personal experience the difficulty encountered in producing lists of recommended reading; inevitably some good works are left off the list, but this does not in any way detract from the usefulness of the book.

Saddle stitched and nicely bound in boards, with an attractive dust-jacket, this book is both a decorative and useful addition to the library of the butterfly enthusiast, though I would be unlikely to buy it were the price any higher. Had the typesetting and the printing not been performed abroad I dread to think how much one would have had to pay per copy!

COLIN W. PLANT

Book Review

Butterflies: The Lycaenidae. By Michael Easterbrook. Shire Publications Ltd, Aylesbury. 1988. 24pp. £1.25. ISBN 0 85263 945 7.

This latest little booklet (No. 24) in the Shire Natural History series provides the reader with a basic introduction to the lycaenid butterflies (hairsteaks, coppers and blues) of Britain. As expected from this particular author, the text is clear and authoritative, condensing a lot of useful information in a bare minimum of space, though there is nothing new that cannot be gleaned from existing books. Accounts are given of the fourteen currently resident breeding species of British descent, of the officially extinct large blue, of the reintroduced large copper and of three immigrant species. Sadly no mention is made at all of the several species of dubious occurrence which never the less appear in many published British lists; in a booklet dedicated to a single family in a single country I find the omission of even just a passing mention rather strange.

What really spoils the book, however, is the inclusion of a number of poor quality colour photographs. Six photographers are involved and the standard of photography varies considerably. Many of the pictures selected are simply not in focus – none more so than the common blue at the top of page 5. This particular example is so fuzzy at the edge that I am amazed the publishers let it through. Even within the works of a single photographer there is variation: the picture of the underside of the female common blue on page 8 is crisp and clear whilst the picture with which we are intended to compare it, that of the underside of the brown argus beneath, is poorly focused and a touch over exposed.

I find it difficult to decide who will buy this book. A work for the expert it is not. The reaction of a friend who has an interest in wildlife generally but no particular knowledge was interesting; he picked it up, looked at the cover, enquired what the Lycaenidae was and promptly put it down again. I suspect that had the title been something more along the lines of 'Butterflies: the blues, coppers and hairsteaks' he may have opened the cover. When he saw the price, however, all was lost.

All this is a pity. This particular series of natural history publications from Shire is on the whole quite excellent, taking a single area of a wider topic and presenting this to a wide lay-audience. The text in this particular volume is fine as I have said, but everything else about it lets it, and the series as a whole, down rather badly. Never the less, a useful stocking filler for an interested child at Christmas.

COLIN W. PLANT

We have since received No. 25, *Grasshoppers and Bush-crickets*, by Andrew Mahon, No. 26, *The Grey Seal*, by Sheila Anderson, No. 27, *The Mute Swan*, by Janet Kear, No. 28, *The Oystercatcher*, by Desmond Nethersole-Thompson, and No. 32, *The Ledgehog*, by P. A. Morris. Ed.

A Comparison of the Structure and Composition of an Ancient and an Adjacent Recent Wood in Essex

by S. D. WEBSTER* and K. J. KIRBY**

Abstract

The structure and floristic composition of adjacent ancient and recent woods in north-west Essex were compared in spring 1986. The ancient wood had a more varied structure and a richer ground flora. However, some plants regarded as typical 'ancient woodland indicator species' had invaded the recent wood and on a simple presence-absence basis these plants, as a group, were not more restricted to the ancient wood than other species. The implications for nature conservation evaluation are discussed.

Introduction

Peterken (1974, 1977) drew attention to plant species which in Lincolnshire were more or less confined to ancient woodland. Subsequent studies, for example Peterken & Game (1984) have confirmed that there can be substantial differences in the flora of ancient and recent woods. It is sometimes assumed that certain plants of ancient woods – referred to as 'ancient woodland indicator species' – are confined to ancient woods and unable to invade recent ones, but there is surprisingly little published information about the occurrence of such species in recent woodland. Rackham (1975) studied the tree composition and ground vegetation of a piece of secondary woodland known as 'The Triangle' adjacent to ancient woodland at Hayley Wood in Cambridgeshire. This area, which was a field with scattered bushes in 1922, now contains most of the trees of the ancient woodland. Rackham mapped the position of every plant (or group of plants) of oxlip *Primula elatior*, bluebell *Hyacinthoides non-scripta* and dog's mercury *Mercurialis perennis*. Oxlip was shown to be the least mobile of the three, invading from its biggest concentration in the ancient wood at a rate of about 1.3m a year. Bluebell was the most mobile, invading both from the ancient wood and from an adjacent hedge. Rackham concluded that it would take at least 150 years for the ground vegetation of The Triangle to approximate to that of the old wood.

Rackham (1980) warned of the dangers of extrapolation and use of ecological data on ancient woodland species gained in one part of Britain for other regions and emphasized that species do not show the same degree of restriction to ancient woodland even within different parts of eastern England. With similar considerations in mind, Gough (1979) drew up a list of woodland species apparently confined to ancient woodland in the area west of Salisbury, Wiltshire. The ancient woodland within her study area included several ancient secondary woods flanking a Roman road and containing Iron Age and Roman earthworks. Parts of the Roman road, and the adjacent woods, which could be shown to be post-Roman in origin, contained several of the species on her 'ancient woodland' list. Gough concluded that in over 1,500 years there had been time for recolonisation of the linear site of the Roman road from adjacent areas. In Oxfordshire, Gibson (1988) similarly found that 'ancient woodland indicators' could spread into adjacent secondary woods. Such situations must be investigated if we are to understand the reasons for the observed differences between ancient and recent woodland.

The mechanisms that result in a particular plant species being more common in ancient rather than recent woodland are likely to vary from species to species. The colonising ability of a species (whether by vegetative spread or seed dispersal) is one factor (Peterken & Game 1981). However, even in situations where there

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appear to be few physical barriers to colonisation of a recent wood, differences between sites might still be maintained by variations in soil or management that are linked to the wood's origins.

In this study, the distribution of species and the variations in woodland structure were investigated to quantify the differences between adjacent ancient and recent woods in Essex and so perhaps make it easier to identify their causes. Scientific names follow Clapham *et al.* (1981).

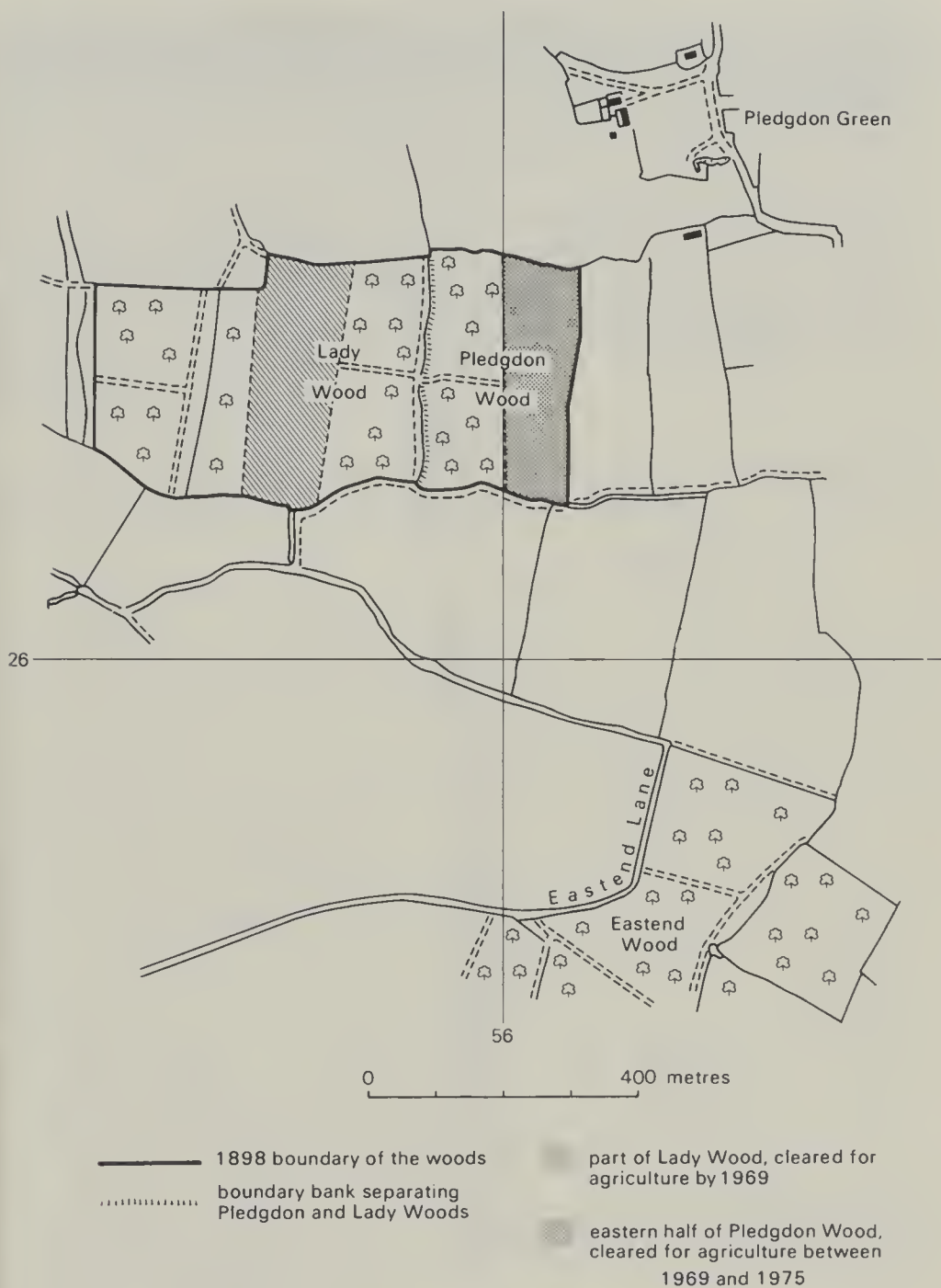
Sites

Pledgdon Wood (10.9 ac, 4.4 ha) and Lady Wood (9.4 ac, 3.8 ha) are two small, adjacent rectangular woods which lie on the boundaries between the parishes of Broxted, Henham and Elsenham in north-west Essex (Fig. 1). The two woods abutt one another along their longer sides, being separated only by an ancient wood bank and ditch on the western side of Pledgdon, and a common ride which runs approximately north-south between them. The woods overlie a boulder clay plateau to the north, descending to the bottom of a minor valley in the south, with a small stream running along their southern edges. The soils of the northern plateau are Oak Series, with better drained, more clayey soils to the south, indicating a transition to the Hanslope Soil Series (Rackham, unpublished report, 1980).

Both woods conform to the W8 (*Fraxinus excelsior* – *Acer campestre* – *Mercurialis perennis*) woodland community type recognised in the National Vegetation Classification (Rodwell, 1986). Pledgdon Wood (National Grid Reference 52/559264) is an ancient wood, defined as having continuity of woodland cover since at least 1600 (Peterken 1977). Although it is not marked on the Chapman and Andre map of Essex in 1777, this map is notoriously inaccurate away from roads. Pledgdon Wood appears on the 1st edition of the one inch Ordnance Survey map of 1805, and it was then a much larger wood, extending for about a mile further to the east. The parish tithe map for Broxted in 1839 (ERO Reference D/CT55A) gives the area of the wood as 19 acres and 24 perches (7.8 ha). The wood was reduced to its present extent when the eastern half was grubbed out, between 1969 and 1975.

Dr Oliver Rackham (University of Cambridge) made a survey of the woods in 1980 and the following account of Pledgdon is taken from his unpublished report. "Pledgdon is certainly an ancient wood with typical earthworks and structure. In its tree communities and vegetation it is a good, though fragmentary example of native woods in NW Essex. It has a simple mosaic of woodland types, mixed hazel wood predominates, with areas of field maple – hornbeam and non-invasive elmwood in the south. This last has been attacked by Dutch Elm Disease, so that although the stools are still alive, gaps have been created in the canopy. The coppice has been largely disused for some 40 years but an area was cut in about 1975 and has good regrowth. A similar area felled in 1978 has been badly grazed by deer. Timber trees (mainly oak) form a dense canopy in the north of the wood, but are less dense in the south. The ground vegetation is dominated by *Mercurialis perennis* with some *Rubus fruticosus* agg. Trees and herbs are weakly correlated. Much of the flora of Pledgdon Wood is in the newly coppiced panels. Coppicing plants include oxlip *Primula elatior*, *Silene dioica*, *Angelica sylvestris*, *Hypericum hirsutum*, *Lychnis flos-cuculi*, *Cirsium palustre* and *Dipsacus fullonum*".

Lady Wood is of much more recent origin. The parish tithe map of Henham in 1840 shows the land on which Lady Wood now stands as an arable field called Great Reedings. A sales catalogue of 1889 for the Shortgrove Estate (ERO Reference No. D/CT 176A) shows that Lady Wood remained unplanted to this date, but the land was evidently planted up shortly after it was sold, for the second edition of the six-inch Ordnance Survey map (1898) shows the land planted with a mixture of broadleaves and conifers and renamed as Lady Wood. It is shown



Based upon the 1986 Ordnance Survey 1:25 000 map with the permission of the Controller of Her Majesty's Stationery Office, Crown copyright reserved

FIG. 1. Location of Pledgdon and Lady Woods (north Essex) and their former extent.

again in this state in a sales catalogue of 1922 (ERO Reference No. A 319). Like Pledgdon Wood, Lady Wood was then larger than now, extending westwards. The land to the west of the present woodland boundary is said to have been cleared by 1969 (Fig. 1).

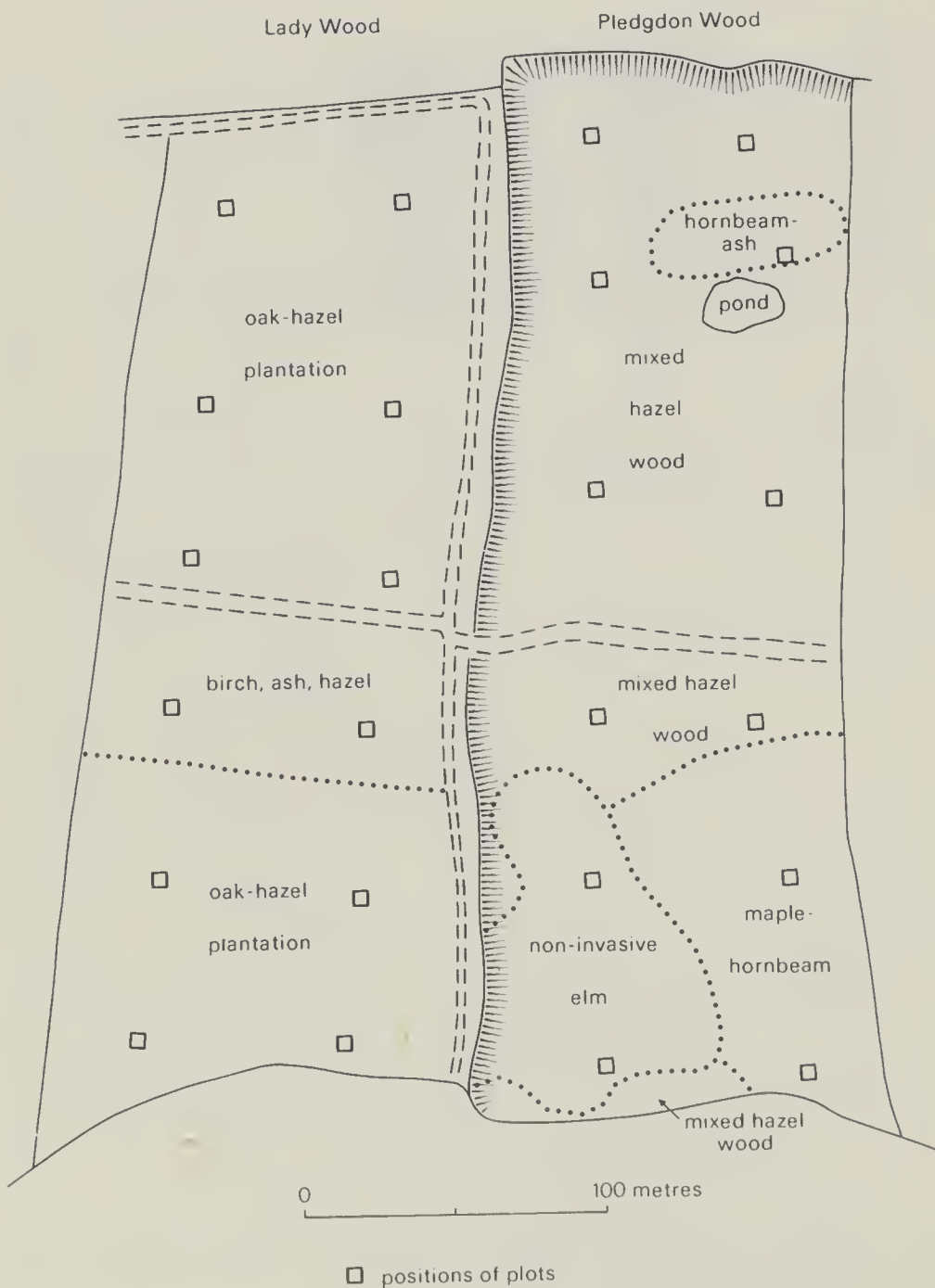


FIG. 2. Variation in tree and shrub communities (from surveys by Dr O. Rackham) and location of the plots used in this survey.

The following description of Lady Wood is also taken from Dr Oliver Rackham's (1980) unpublished report. Lady Wood, although recent, 'is a well-developed wood, with underwood as well as timber trees. The underwood is entirely of hazel, small, regularly spaced stools about 1ft diameter, which given the recent origins of the wood can only have been planted. Lady Wood is thus of interest as one of the very latest instances of a plantation made in imitation of native woodland; people were still planting hazel as underwood because text books (e.g. J. Nisbet 1893) recommended it, even though native hazel woods were starting to fall into neglect. In the northern half of the wood, the timber trees are all oaks, closely spaced, and partly in rows, and evidently planted, though less uniform genetically than is usual in oak plantations; the hazel is shaded and weak. In the southern third, the oaks (and some ashes) are widely spaced, and the underwood is more flourishing. The remainder of this wood has abundant big birches and ashes, which, like the oaks, have suppressed the hazel. Half this area has been recently coppiced'.

Methods

In 1986 we carried out a second survey using a series of twelve sample plots distributed regularly (at approximately 50m intervals) through the wood (Fig. 2).

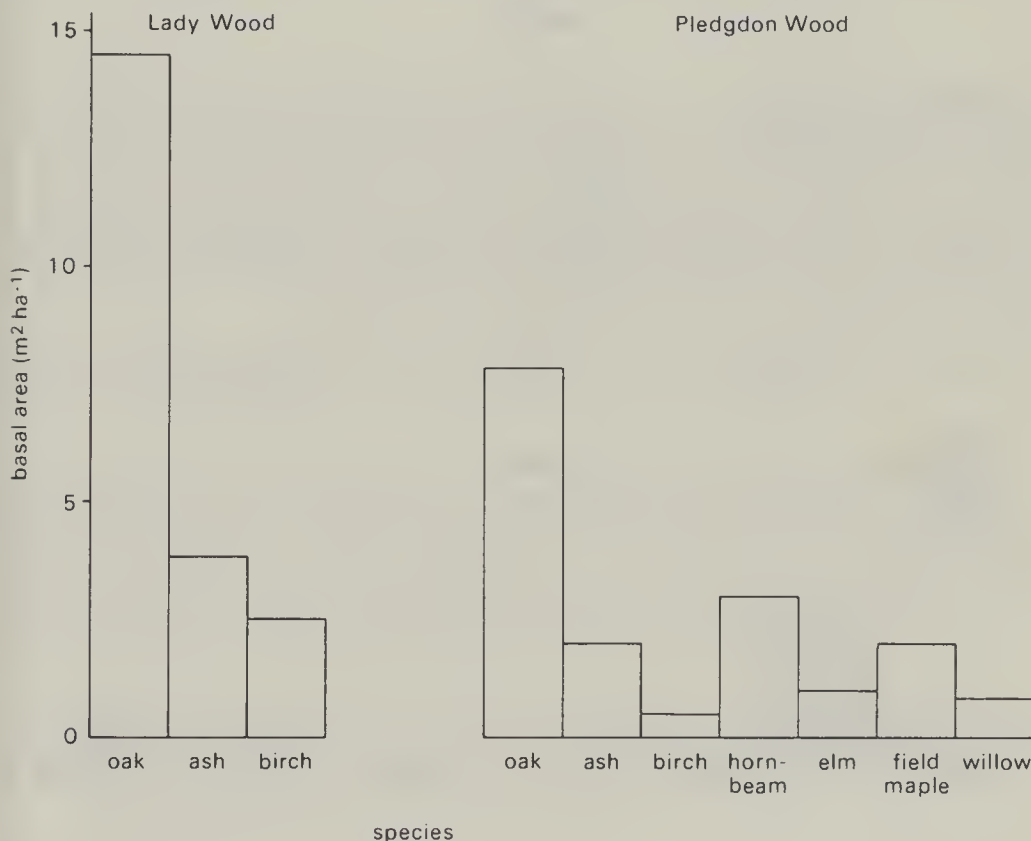


FIG. 3. Basal area of timber by species (m² ha⁻¹).

A regular pattern was chosen to provide an even distribution of plots which makes it easier to detect patterns of species distribution. The sample plots were located in March by pacing along a compass bearing. The centre of the plot was marked by a cane. The tree and shrub cover at each point was assessed in the following ways.

- i. The mean basal area per hectare of 'timber' species (including field maple *Acer campestre*, but excluding shrubs such as hazel, hawthorn *Crataegus* spp., elder *Sambucus nigra* and dogwood *Cornus sanguinea*) was assessed using a relascope. (Relascope or angle gauge sampling is widely used in forestry to assess basal area. Trees 'count' in the relascope sweep if their trunk diameter subtends an angle at the sampling point greater than a given value).
- ii Trees within a 10 × 10m quadrat centred on the marker cane that were more than 5cm diameter at breast height (dbh) were measured using diameter tapes. The height of the largest diameter tree in the quadrat was estimated using a hypsometer.
- iii. Bushes or stools of shrub species within the 10 × 10m quadrat were counted, as were any trees which were less than 5cm dbh.

In May a second visit was made to assess the ground flora. Ground flora species (including trees less than one metre high) within a 10 × 10m quadrat centred on the marker canes were noted and their abundance assessed on the Domin scale (Fig. 8).

Results

Tree and shrub layers

Based on the relascope scores (Fig. 3) Lady Wood contains about 20% more timber than Pledgdon, largely because the latter has more open areas, for example where the elm has died. The variation in woodland types mapped by Rackham in Pledgdon Wood is reflected in the 5 to 15% of the total basal area contributed by elm *Ulmus* spp., hornbeam *Carpinus betulus*, willow *Salix* spp. and field maple, none of which appears in the Lady Wood scores. Oak, ash and birch are correspondingly more abundant in Lady Wood.

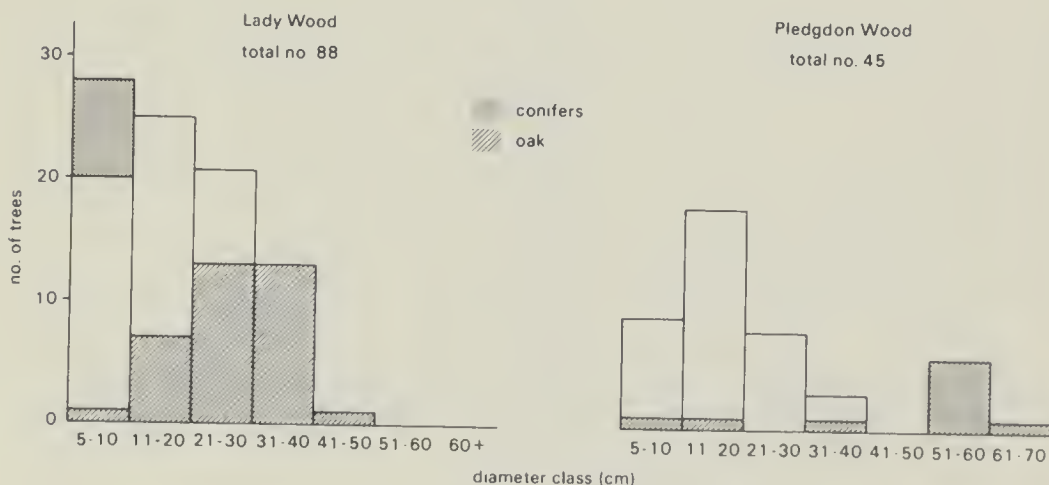


FIG. 4. Distribution of diameter sizes for trees greater than 5cm (dbh).

The plots in Lady Wood contained more trees over 5cm dbh than Pledgdon Wood but fewer species, two of which were underplanted conifers (Fig. 4). The recent plantation origin of the wood is reflected in the size distribution of the

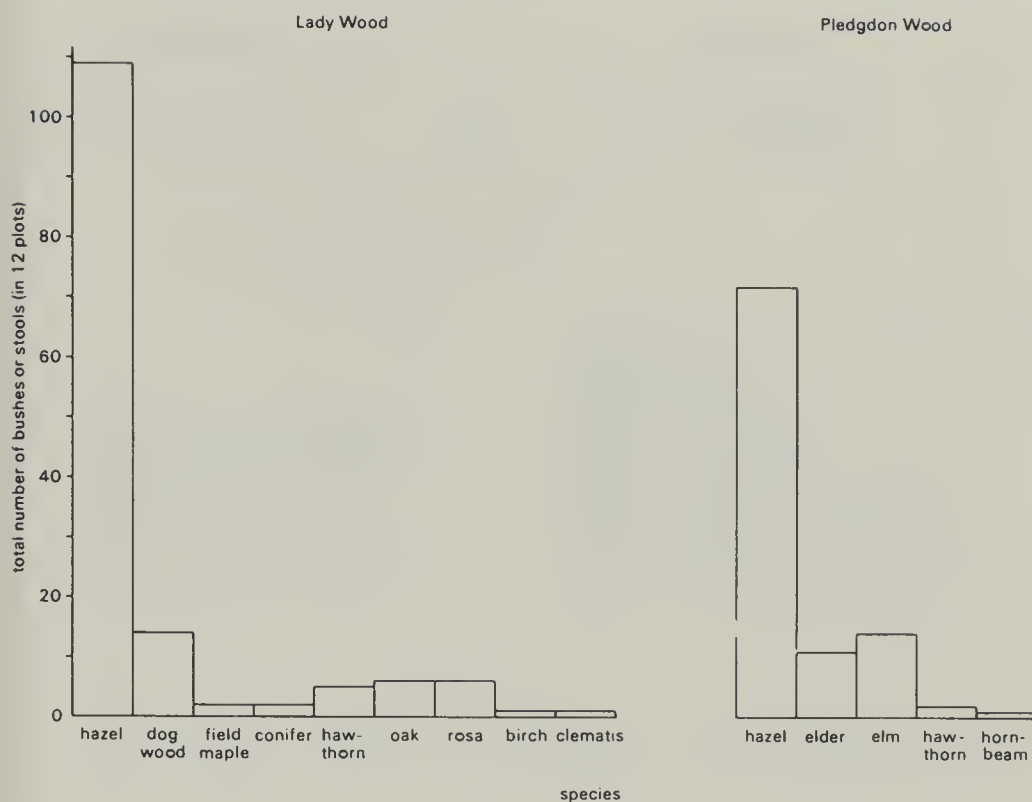


FIG. 5. Number of bushes or stools of shrubs and small trees (less than 5cm dbh).

trees, in particular the scarcity of trees over 40cm. Most of the stems in Pledgdon are small coppice poles (less than 20cm dbh), but scattered throughout are the former standards over 50cm dbh.

Shrubs and young trees were more abundant both in terms of species and individuals in Lady Wood (Fig. 5). The number of hazel stools is high because they were planted at close spacing and they tend to be smaller than those in Pledgdon Wood. Hawthorn, dogwood, roses *Rosa* spp. and traveller's joy *Clematis vitalba* commonly invade old fields or young plantations in this part of Essex, but the abundance in Pledgdon of elder, a species often associated with secondary woods, and its absence from Lady Wood plots is surprising.

The trees tend to be taller in Lady Wood, partly because there is a greater proportion of tall-growing species such as oak and ash in this wood (Fig. 6), but even if only the oaks are compared, those in Pledgdon are still slightly shorter.

Ground flora

In his survey, carried out in December 1980, Rackham (unpublished report, 1980) recorded 61 species of vascular plant in Pledgdon (the ancient wood), and he considered it to be unusually rich for its size. In May 1986, a total of 51 species were recorded in the plots in Pledgdon Wood and 32 in Lady Wood. Table 1 gives a comparison of the species-richness of the two woods according to different criteria. Pledgdon is the richer of the two woods, however this is assessed.

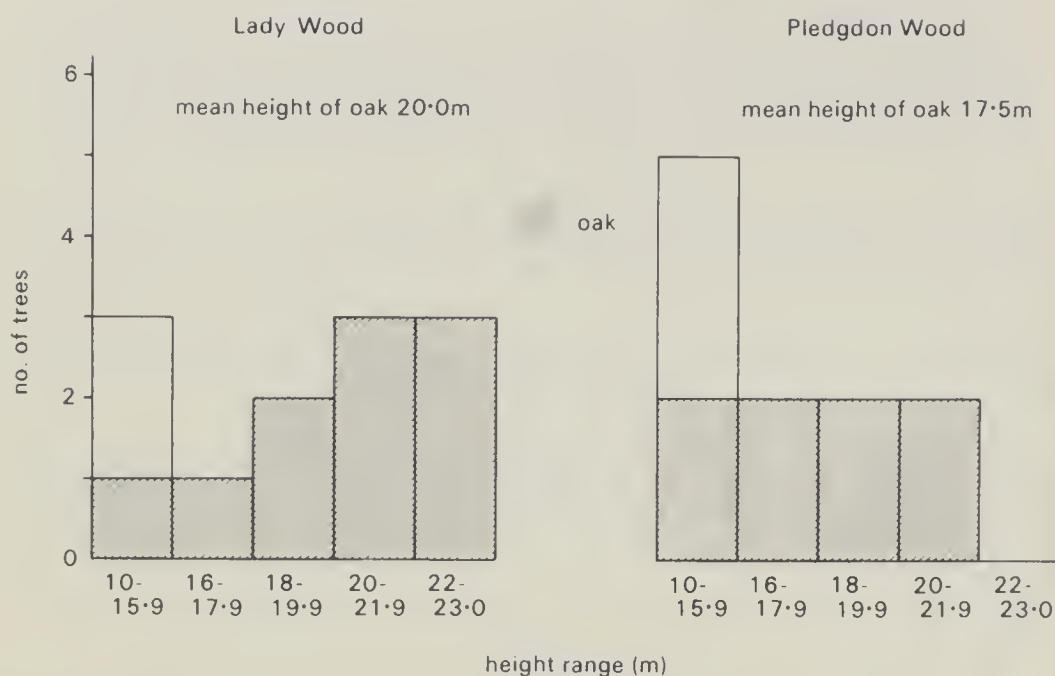


FIG. 6. Height distribution for the largest tree in each plot.

TABLE 1. A comparison of species-richness in Pledgdon and Lady Woods.

Total number of species found (both woods) 56

	Pledgdon Wood (Ancient)	Lady Wood (Recent)
Total number of species recorded in plots	51	32
Number recorded in more than 3 out of the 12 plots	24	15
Number of species recorded more frequently in one wood than in the other	39	12
Mean number of species per plot	17.3 (± 1.8)*	11.6 (± 1.0)*
**Number of 'ancient woodland species'	9	4
Mean number per of 'ancient woodland species' plot	2.5	1.25

*Standard errors have been calculated as though the plots were randomly rather than systematically distributed, but they give some indication of the variation between the plots.

**based on lists for eastern England (Peterken 1974, Rackham 1980).

Twenty-two species were more or less equally abundant in the two woods (Table 2). Twenty-three were present in only one wood, but at such low frequency that it may just be chance that they were not present in the records for the other wood. However if chance sampling alone were involved, an equal distribution of these species between the two woods would be expected. In fact more occurred in Pledgdon. Finally, 11 species were markedly more frequent in one or other wood with the balance again being towards Pledgdon.

Rackham (1980) commented on the fidelity of different plant species to ancient woodland sites in eastern England. These possible 'ancient woodland indicators' are more abundant in Pledgdon Wood, but so is the rest of the flora. As a group, ancient woodland indicators were not more restricted to the ancient woodland

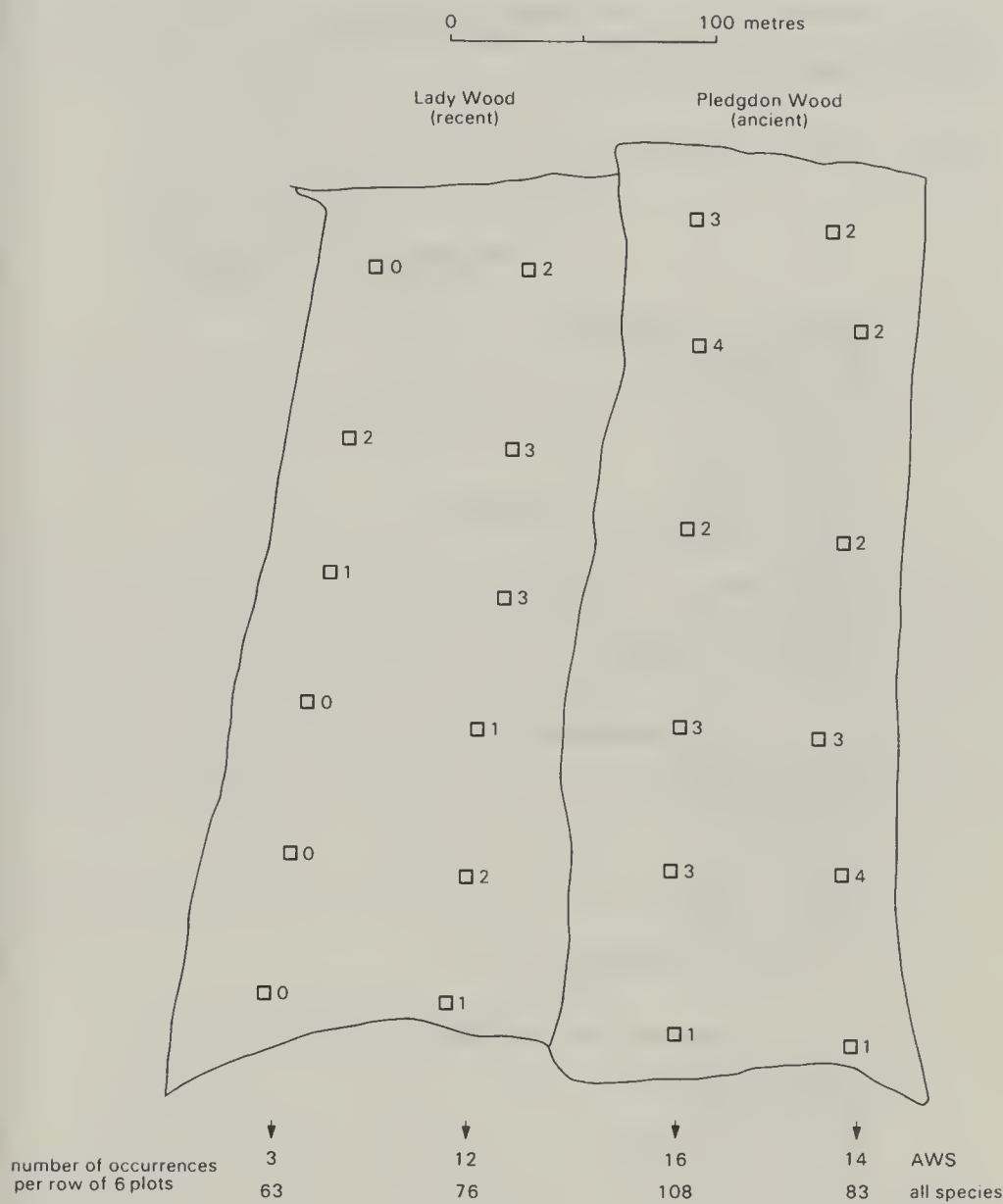


FIG. 7. Number of occurrences of 'ancient woodland indicators' per plot in relation to location of plots.

than other species (Table 3). Among the species considered colonisers of secondary woodland, *Galium aparine* was largely in Pledgdon, whilst *Brachypodium sylvaticum* was mainly in Lady Wood. (Rackham (1975) notes that *Brachypodium* is also very abundant in 'the Triangle' – the recent part of Hayley Wood). However, there is a tendency for 'ancient woodland indicators' recorded within Lady Wood to be most frequent in the plots nearest Pledgdon (Fig. 7).

The estimates of species cover within quadrats were subjective and must therefore be treated with caution. Nevertheless, for species with equally high frequency of occurrence in both woods the Domin values suggest a difference in

relative abundance (Fig. 8). For example, while the cover estimates for *Circaea lutetiana* are very similar in the two woods, *Mercurialis perennis* appears to be more abundant in Lady Wood.

TABLE 2. Frequency of occurrence of different species in the two woods.

	Pledgdon Wood (Ancient)	Lady Wood (Recent)
a. Abundant in both woods		
<i>Mercurialis perennis</i>	12	12
<i>Poa trivialis</i>	10	10
<i>Urtica dioica</i>	10	7
<i>Circaea lutetiana</i>	9	12
* <i>Primula elatior</i>	9	7
<i>Rubus fruticosus</i>	9	7
<i>Geum urbanum</i>	8	8
<i>Crataegus monogyna</i>	7	4
<i>Viola</i> spp.	6	8
<i>Listera ovata</i>	5	7
<i>Angelica sylvestris</i>	5	4
<i>Rosa</i> sp.	4	5
<i>Deschampsia cespitosa</i>	3	5
b. Rare, occurring in both woods		
* <i>Paris quadrifolia</i>	4	3
<i>Rumex sanguineus</i>	4	3
* <i>Carex pendula</i>	3	3
<i>Acer campestre</i>	3	2
<i>Festuca gigantea</i>	3	1
<i>Bromus ramosus</i>	2	1
<i>Dryopteris dilatata</i>	2	1
* <i>Orchis mascula</i>	1	2
<i>Chamerion angustifolium</i>	1	1
c. Rare, and occurring in only one wood		
<i>Stachys sylvatica</i>	2	—
<i>Hypericum hirsutum</i>	2	—
<i>Potentilla sterilis</i>	2	—
* <i>Lamium galeobdolon</i>	1	—
* <i>Conopodium majus</i>	1	—
<i>Prunus spinosa</i>	1	—
* <i>Carex remota</i>	1	—
<i>Juncus effusus</i>	1	—
<i>Cirsium palustre</i>	1	—
<i>Carpinus betulus</i>	1	—
<i>Hypericum tetrapterum</i>	1	—
* <i>Veronica montana</i>	1	—
<i>Rumex crispus</i>	1	—
<i>Cirsium arvense</i>	1	—
<i>Epilobium hirsutum</i>	1	—
<i>Myosotis</i> sp.	1	—
<i>Lathyrus pratensis</i>	1	—
<i>Ulmus glabra</i>	1	—
<i>Fraxinus excelsior</i>	—	2
<i>Anthriscus sylvestris</i>	—	1
<i>Cornus sanguinea</i>	—	1
<i>Ribes sylvestre</i>	—	1
<i>Heracleum sphondylium</i>	—	1

d. Common, but markedly more frequent in one wood than the other

<i>Ranunculus ficaria</i>	11	—
<i>Arum maculatum</i>	9	5
* <i>Anemone nemorosa</i>	9	—
<i>Carex sylvatica</i>	7	3
<i>Galium aparine</i>	7	1
<i>Filipendula ulmaria</i>	7	—
<i>Epilobium montanum</i>	4	—
<i>Sambucus nigra</i>	4	1
<i>Veronica chamaedrys</i>	4	—
<i>Dryopteris filix-mas</i>	4	—
<i>Brachypodium sylvaticum</i>	1	8
	<u>208</u>	<u>138</u>

*Species provisionally associated with ancient woodland in eastern England (Pterken 1974, Rackham 1980).

Discussion

Both woods are mature stands of native trees and shrubs, separated only by a narrow ride, yet each has a distinct composition and structure. In Pledgdon the pattern of tree and shrub communities is likely to be caused partly by soil variations within the site and partly by processes of succession and competition between the main species that have become 'frozen' by a period of coppice management. The pattern in Lady Wood is simpler and reflects the effects of the original planting, plus a short period of neglect.

The ancient wood does have the richer ground flora, and more ancient woodland indicators, but individual species have behaved in different ways. Spread of some 'ancient woodland' species, such as the oxlip, into the recent

TABLE 3. Relative abundance of 'ancient woodland' species and other species in the two woods.

	Pledgdon Wood (Ancient)	Lady Wood (Recent)
a. Number of species recorded		
'Ancient woodland' species	9	4
Others	42	29
b. Number of species occurrences		
'Ancient woodland' species	30	15
Others	178	115

The difference in the relative abundance of 'ancient woodland species' compared to the rest of the flora (9/42 : 4/29 etc.) in the two woods was non-significant using a χ^2 test.

woodland has been rapid, whereas *Anemone nemorosa* is still limited to the ancient woodland, perhaps because its seed production is poor. Species which are normally good colonists (*Galium aparine*, *Sambucus nigra*, *Filipendula ulmaria* and *Brachypodium sylvaticum*) are not equally widespread in the two areas either, which suggests that there may be soil differences between the sites. Lady Wood was almost certainly established on arable fields, and it is possible that this former agricultural use has left the soil both better drained and more base-rich. This might explain, for example, the greater abundance of *Mercurialis perennis* and *Brachypodium sylvaticum* in Lady Wood and of *Filipendula ulmaria*, *Cirsium palustre*, *Juncus effusus* and *Carex remota* in Pledgdon Wood.

Finally, there is the effect of temporary openings in the canopy whether by coppicing or elm disease that have allowed in species such as *Rumex crispus*,

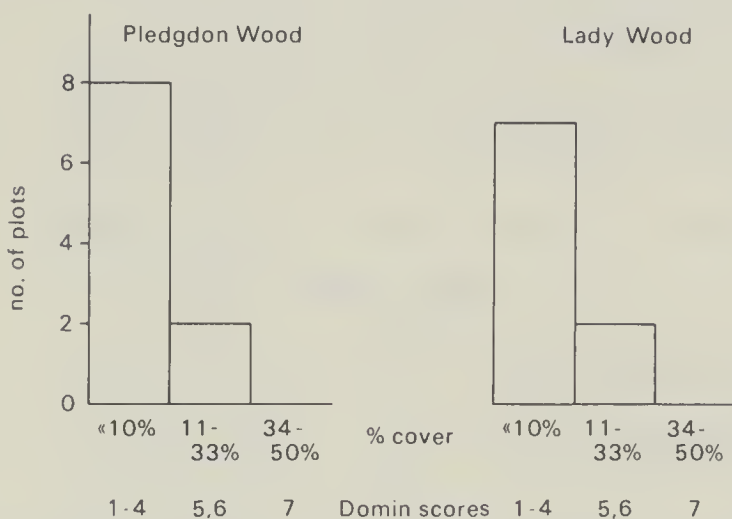
(a) *Mercurialis perennis*(b) *Poa trivialis*

FIG. 8. Distribution of Domin cover values for *Mercurialis perennis* and *Poa trivialis* in the two woods.

Lathyrus pratensis and *Cirsium arvense*. These temporary openings, and the plants associated with them, are more frequent in Pledgdon than in Lady Wood, although the relative species-richness of Pledgdon does not depend solely on this difference. This last group of plants is more or less characteristic of woodland disturbance and is of limited value in assessing the value of the ancient, semi-natural woodland for nature conservation (cf. Ratcliffe 1986).

The survey confirmed that the ancient woodland was more species-rich than the recent area, but three types of factor, namely management, soil, and species colonisation ability, are operating to create the observed differences. In this instance they appear to reinforce one another, but on other sites this might not be the case. There is a danger in placing too much reliance on 'ancient woodland indicators' without a clear understanding of the ecological basis for their

behaviour, which will not always be the same under varying circumstances. There needs to be more consideration as to how they behave where ancient and recent woods are contiguous, as distinct from isolated blocks of woodland of a single origin. Further ecological data on the species concerned, and comparative case-studies of adjacent recent and ancient woods in different parts of Great Britain, are needed. In the light of current discussions on new woodland planting this study has highlighted the value of establishing new woods next to ancient sites rather than as isolated blocks.

Acknowledgements

We are grateful to Mr John Smith for allowing us to visit his woods. Dr Chris Gibson and David Harpley helped with recording field data; Dr Oliver Rackham kindly made available his unpublished data, and gave advice on the manuscript; Dr George Peterken, Jonathan Spencer and Chris Preston made valuable comments on an earlier version of the text, and the Ministry of Agriculture, Fisheries and Food, and Essex Public Records office have made available maps and information.

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Book Review

Sharks. Seventeen Contributors. Consulting Editor John D. Stevens. Merehurst Press, London, 1987. 240pp. £16.95. ISBN 0 948075 68 6.

Shark! This word would strike a chill into the heart of any bather on a Californian or Australian beach, but of course, this only refers to the great white which is certainly an awesome beast of the deep. However, sharks, in common with much of wild life, are under threat from the depredations of the arch predator and despoiler of the Earth – Man. Some people will say a good thing too, but here this excellent book should be taken up and consulted. It will be seen that sharks come in all sorts of fascinating shapes and sizes, some even larger than the highly efficient predator, the great white, down to the tiny pygmy ribbon-tail catshark *Eridnaxis radcliffei*.

The book has 17 contributors, all experts in their various fields, and it contains a wealth of superb colour photographs. It deals firstly with the evolution of the shark, and points out that the fossil record is three times as long as that of the dinosaurs taking the reader back to the paleozoic sharks, the most ancient of which, *Cladoseleache*, is approximately 400 million years old. Various fossil sharks and their teeth are depicted, and the reconstruction of the ancient monster *Carcharodon megalodon* is dealt with in interesting detail.

After this, the book moves on to the kinds of shark, and the reader learns that there are eight orders of sharks and how bizarre are some of the species in the various families which comprise the orders. Notes regarding appearance, size, habitat, distribution, reproduction and diet appear for each family.

Following on are chapters entitled Shark Distribution, Biology, Senses, Behaviour and Ecology, all of which expound in detail numerous fascinating and interesting facts and information on all these subjects. The chapter dealing with distribution has many useful distribution maps at the bottom of the pages. In the chapter concerning biology, the diversity of form and function of shark tails are shown and discussed. Friends and enemies are described, and apart from the pilot fish, such animals as the banded coral shrimp, which picks off the sharks' parasites, are mentioned along with the various parasites which trouble sharks. Specialization, respiration, and circulation, to name but a few of the subjects which are dealt with in depth in this very comprehensive chapter. The chapters on behaviour and ecology inform the reader of so much that he was unaware, and will make him realize that there is more to sharks than would first appear.

The middle section of the book concerns shark attack, and details in separate geographical chapters show where these occurred. This subject is treated with the same thoroughness that typifies the whole of this book. There are interesting accounts of servicemen who were wrecked or crashed into shark-infested seas during the last war. Potentially dangerous species are listed in this section.

The final section is entitled 'Myth and Reality' and is just that. The reader is told of the Polynesian shark-god Kauhuhu and of Menalo. There is an interesting insight into the folklore of the Solomon Islands relating to sharks, and there are references to literature under the heading 'The Literary Shark' and historic paintings. There are compelling chapters on using sharks, sharks at close quarters, in the shark cage – which must be a horrendous experience – repelling sharks: good to know that this is possible as text and pictures show. A checklist of living sharks and a useful bibliography are given at the end of this truly amazing and enthralling book.

In conclusion I must say that it has been a great pleasure and privilege to have been asked to review this magnificent book which is full of scientific fact and information, all in a most readable form. A book difficult to put down once opened, and of immense value to not only the naturalist, conservationist and biologist, but also to the layman. It should dispel the myths borne of such films as 'Jaws', and create an understanding of these mighty creatures of the world. I would not hesitate to recommend purchase of this book to all.

R. V. GOULDING

Survey of a Group of Ponds in Epping Forest

by ELISABETTA COLOMBO*

Summary

Epping Forest has a large number of ponds, many of which are man-made gravel pits. A survey, carried out between April 1986 and July 1987 in three sites of Epping Forest, aimed to monitor colonization and succession of vegetation of newly created ponds. The ponds were all small gravel pits, four of which were located at Wake Arms, two at Deershelter Plain and one near Strawberry Hill Pond. Maps of the vegetation were drawn and lists of the flora were compiled. Water samples were collected and water temperature was measured from the water surface, monthly, from the banks of the ponds, at intervals of about 10-20 metres and pH analysis was carried out in the laboratory.

Introduction

Epping Forest has a large number of ponds, bogs and marshes. There are about 150 ponds of various size and depth, with a variety of vegetation. These areas provide good habitats for many animals and plants and are very interesting sites for study. Recently these wetlands have declined for various reasons; firstly the invasion by trees, especially birch, that cause marsh to dry out (e.g. Deershelter Plain and Sunshine Plain); secondly the overshadowing by uncut and unbrowsed foliage (e.g. certain *Sphagnum* bogs in the northern half of the Forest); and, locally, by drainage through digging ditches (e.g. Almshouse Plain) (Corke 1978). Most of the Forest ponds are man-made gravel diggings, while a few of them are bomb craters or were created for watering cattle. Gravel excavation has been a common practice in Epping Forest for many years. The gravel was mainly extracted for road repairs, but some was specifically taken out to create ornamental ponds (Layton 1986).

The aim of this project was to monitor the recolonization of the vegetation after pond clearance and pond creation. The survey was carried out in seven ponds at three sites in the Forest. Four of these ponds are located at Wake Arms (Grid ref. TQ426995); they are a group of gravel pits situated on the right hand side of Wake Arms Road just before Wake Arms roundabout. Two small ponds are gravel pits and are located at Deershelter Plain (TQ426986) and the last is a gravel pit near Strawberry Hill Pond (TQ414965).

The nomenclature follows Clapham, Tutin and Warburg (1981).

Description of Sites

WAKE ARMS PITS (TQ426995)

The ponds area is surrounded by beech *Fagus sylvatica* woodland, with few oak *Quercus robur* and birch *Betula pendula* trees. The ground flora is quite poor, the soil being very acid pebble gravel.

DEERSHELTER PLAIN (TQ426986)

This area that once consisted of open wet heath, is now a deciduous woodland with silver birch *Betula pendula* as the dominant species. Many of the birch trees are dead or are dying. There are also some oak pollards *Quercus robur*; other dominant species are: bracken *Pteridium aquilinum*, wavy hair grass *Deschampsia flexuosa*, purple moor grass *Molinia caerulea*. There is some remnant of heath. The two ponds are quite small and are surrounded by grass and bracken.

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STRAWBERRY HILL GRAVEL PIT (TQ414965)

This gravel pit is situated on the south-east side of Strawberry Hill Pond and is also close to Strawberry Hill Heath. Oak *Quercus robur* is probably the most numerous tree in this area. Hornbeam *Carpinus betulus* is also present but it appears to be less frequent. There are some beech of which most show no evidence of pollarding. There is no dominant birch woodland in this area, however there are high numbers of saplings and young trees growing locally. Hawthorn scrub is quite extensive in parts of this area and the main concentration of holly occurs between Strawberry Hill Pond and Earls Path Pond and up to the Robin Hood roundabout.

Field Work

Water Analysis

From April 1986 to June 1987 water samples were collected from the surface, monthly, from the banks of the ponds at intervals of about 10-20 metres. The water samples were sealed in airtight glass vials and were promptly brought back to the laboratory, where pH analysis was carried out, using a pH meter model 610 Corning. At the same intervals along the banks the water temperature was measured using a floating thermometer.

Botanical Survey

WAKE ARMS PITS

During the flowering season 1986-1987 a botanical survey was carried out. A list of the flora of the site and a list of species for each pond was compiled. Vegetation maps of each pond were drawn three times in 1986 and twice in 1987.

DEERSHELTER PLAIN PONDS

A list of species was compiled in June 1987 and a map of the vegetation was drawn up in the same period.

STRAWBERRY HILL GRAVEL PIT

A list of species was compiled during the mapping. A vegetation map was drawn up in June-July 1986 and July 1987.

TABLE 1. Sizes and origins of the three sites.

Wake Arms Pits

	Pond 1	Pond 2	Pond 3	Pond 4
Shape of pond	irregular	irregular	round	round
Length	38.8m	63.5m	36.0m	16.3m
Width	7.0m	14.0m	21.0m	15.7m
Circumference	150m	165m	130m	68m
Depth estimated max.	0.6m	0.6m	1.0m	0.6m
Origin	gravel pit 1834	gravel pit 1834	gravel pit 1984	gravel pit 1984

Deershelter Plain Ponds

	Pond 1	Pond 2
Shape of pond	irregular	irregular
Length	13.5m	9.4m
Width	5.0m	3.4m
Circumference	40m	30m
Depth estimated max.	0.5m	0.3m
Origin	gravel pit 1984	gravel pit 1984

Strawberry Hill Gravel Pit

Shape of pond	irregular
Length	45m
Width	28m
Circumference	—
Depth estimated max.	0.7-1.0m
Origin	gravel pit – end of 19th century

TABLE 2.0. pH ranges at the three sites.

Wake Arms Pits	Min.	Max.
Pond 1	pH 3.1	6.9
Pond 2	pH 3.8	6.35
Pond 3	pH 3.4	6.1
Pond 4	pH 3.5	6.4

Deershelter Plain Ponds

Pond 1	pH 3.0	5.3
Pond 2	pH 3.1	4.6

Strawberry Hill Gravel Pit

pH	3.1	6.1
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TABLE 2.1. Water temperature ranges at the three sites.

Wake Arms Pits	Min. °C	Max.
Pond 1	-3.0	25.0
Pond 2	-1.0	25.0
Pond 3	-1.0	25.5
Pond 4	0	24.5

Deershelter Plain Ponds

Pond 1	0	23.0
Pond 2	1.0	14.5

Strawberry Hill Gravel Pit

-3.0	23.0
------	------

Water Analysis: pH and Temperature**WAKE ARMS PITS**

The pH variation during 1986 and 1987 followed a similar pattern for the four ponds, these variations being displayed in Figure 1. Comparing the pH values of April 1986 and April 1987, there was an obvious drop in the latter month, whereas such a drop did not exist between June 1986 and June 1987, demonstrated in Table 3.0.

TABLE 3.0. The variation in mean pH of Wake Arms Pits between April 1986/87 and June 1986/87.

	April 1986	April 1987	June 1986	June 1987
Pond 1	4.74	3.80	4.60	4.43
Pond 2	5.81	4.28	5.77	5.72
Pond 3	4.42	4.27	4.13	4.92
Pond 4	5.55	4.57	3.86	5.15

The reason for the increase in pH in ponds 3 and 4 may be due to the high rainfall (91mm). June 1987 had convectional rainfall. Due to the heavy rainfall the volume of water increased in all ponds, causing a rising of pH. After some weeks of rain showers, the rain becomes less acidic because the concentration of aerial pollutants is washed out, while after a long dry and sunny period the first

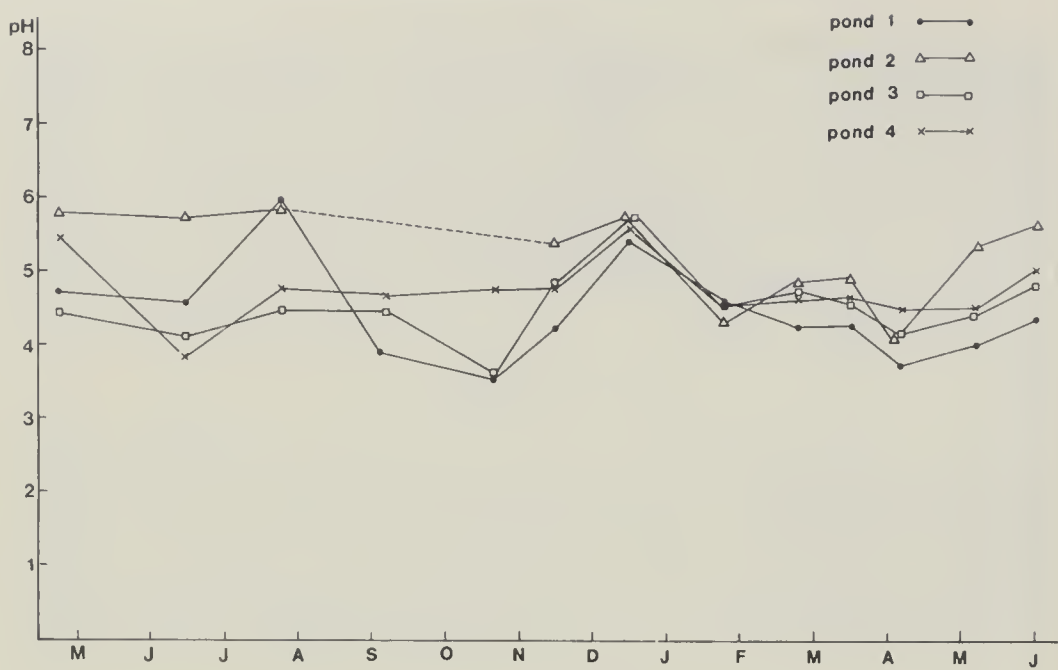


FIG. 1. Variation in pH at Wake Arms Pits.

rain is very acid. This happens because bright spells provide plenty of sunlight to speed chemical reactions, leading to the production of acids. At the same time there is a greater concentration of pollutants in the air, in a form that rapidly produces acids (*Acid reigns again*, WATCH leaflet).

The water temperature varied with weather conditions and local variations (Figure 2). From monthly data (Appendix 4.0) it could be seen that the water temperature varied more than 1 or 2°C in the same pond (e.g. Pond 1, June 1986, site 4: 22°C, site 10: 25°C) the same day of sampling. This was due to local variability such as shade of trees, shallow water, excessive growth of vegetation in the water, exposition to sun, evaporation and changes in water table. The smallest

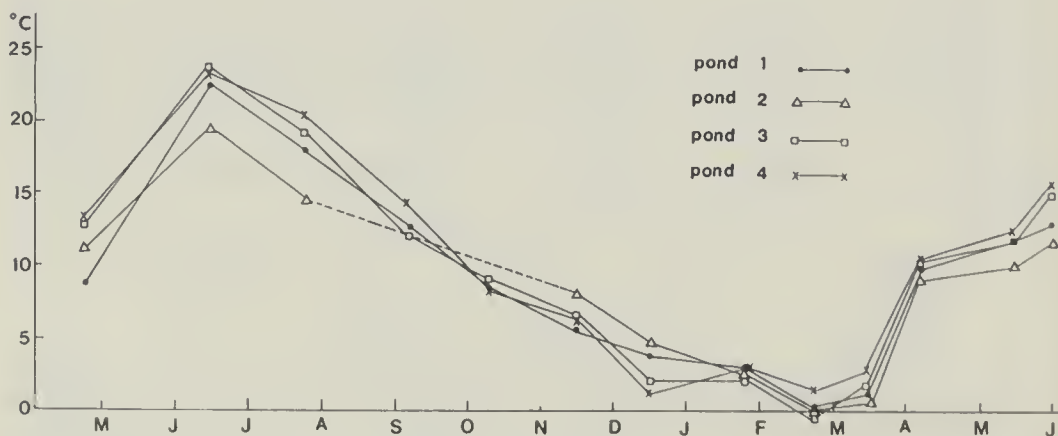


FIG. 2. Variation in temperature at Wake Arms Pits.

pond (Pond 4) tended to be warmer than the others, even if it was never completely dry during summer.

TABLE 3.1. The variation in mean temperature of Wake Arms Pits between June 1986 and June 1987.

	June 1986	June 1987
Pond 1	22.65	12.75
Pond 2	19.6	11.3
Pond 3	23.68	14.27
Pond 4	23.2	15.28

The comparison between the water temperature in June 1986 and June 1987 (Table 3.1) showed a great drop, which was due mainly to the weather conditions. The air temperature for June 1987 was much lower than the average June air temperature taken over a period of years.

In Figure 3 the pH of the ponds was compared with the rainfall and the water table (both measured at E.F.C.C.) during the months of survey. Figure 3 clearly illustrates that the pH of the ponds was affected by the water table. In summer and autumn 1986 the water table was low and the pH of the ponds was divergent. In winter 1986-87 the water table rose causing a convergence of the pond's pH, from December 1986 to April 1987, as illustrated in Figure 3. A possible explanation of this could be that when the water table was low, the ponds were not influenced by ground water and the great divergence in pH was caused by biotic and climatic factors. These might include algal blooms, vegetation growth, sunlight, evaporation and so on. When the water table was high all the ponds were affected by the same water and this caused a convergence of the ponds' pH. The four water bodies were therefore in a more stable and uniform condition. In the winter, biotic factors became less important and they therefore had little influence on the ponds' acidity.

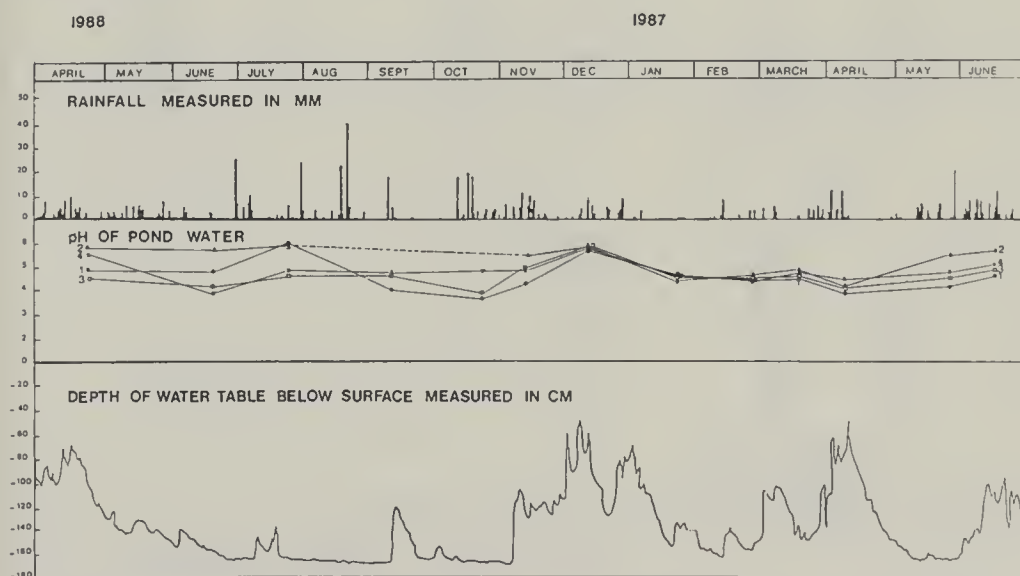


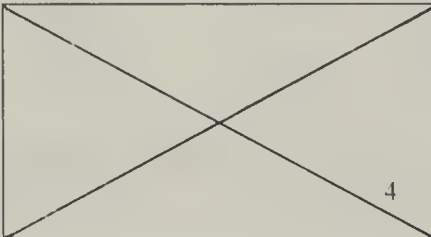
FIG. 3. Rainfall, pH of Wake Arms Pits and depth of water table.



FIG. 4. Distribution of pH at Wake Arms Pits from April 1986 to June 1987.

The maps of the pH distribution in the ponds (Figure 4) illustrate in a very interesting way the comments previously made about Figure 3. From April to November 1986 the pH was very variable. Each sampling month had a range of at least three pH units represented in all the ponds (for example a range of three pH units in October 1986 and a range of four pH units in April 1986), showing that variability was high. From December 1986 the situation was more uniform and the patches with some variation were restricted, showing that the pH of the ponds was similar. The water table and the rainfall were further compared with the standard deviation of the pH means of the four ponds (Appendix 3.0). The standard deviation was generally high when the water table was low, that is the pH means were variable. The standard deviation was generally low when the water table was high, that is the pH means were uniform. However it can be seen from Figure 4 (September 1986) that when the water table was low (Pond 1 was almost dry, Pond 2 was completely dry, Pond 4 was dry in places) the standard deviation was low, that is the pH of the ponds did not diverge. Therefore the water filling the ponds must be ground water. Table 3.2 illustrates the relationship between the water table, the rainfall, the standard deviation and the number of ponds with water. In box 1 the water table is low, the rainfall is high, the standard deviation is high, that is the case for July 1986. In box 2 the water table is low, the rainfall is low, the standard deviation is low, that is the case for September 1986. In box 3 the water table is high, the rainfall is low, the standard deviation is low, that is the case for January 1987. In box 4 there are no results because this case never occurred during the sampling period.

TABLE 3.2 The relationship between the water table, the rainfall, the standard deviation and the number of ponds with water at Wake Arms Pits.

		Water Table	
		High	Low
Rainfall	High		High standard deviation ≥ 0.51 – PONDS 1
	Low	Low standard deviation ≤ 0.50 + PONDS 3	Low standard deviation ≤ 0.50 – PONDS 2

– PONDS Pond 1: dry in most places
 Pond 2: dry
 Pond 3: full of water
 Pond 4: dry in places

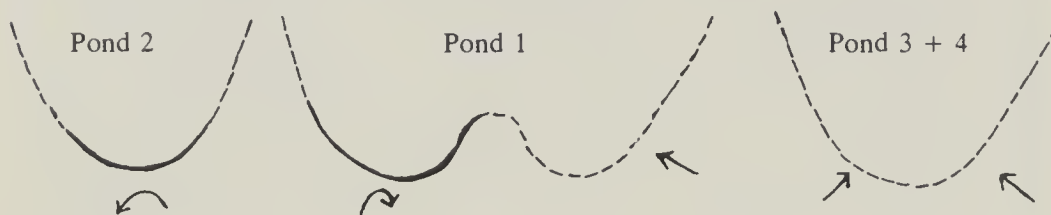
+ PONDS All ponds full of water.

Pond 1 was a very variable pond and probably was either affected by the water table or by the rain. It dried up in places and these dry areas were maybe bottom sealed, while the wet parts were more permeable.

Pond 2 was definitely a stable pond, but it was probably bottom sealed, being dry all summer and autumn. So it was rain filled, or ground water filled only when the water table was high enough. Pond 3 and Pond 4 were quite stable acid ponds

and were permeable, therefore more affected by the water table than the others. They were mainly ground water filled. These observations are illustrated in Table 3.3.

TABLE 3.3. The profile of the substratum at Wake Arms Pits.



The last observation concerns the comparison between the pH of the rain (monthly means Appendix 3.0) and the pH of the ponds. Figure 5 illustrates that the acidity of the ponds followed the pH of the rain in most cases. There was certainly a time lag before the rain influenced the water in the ponds.

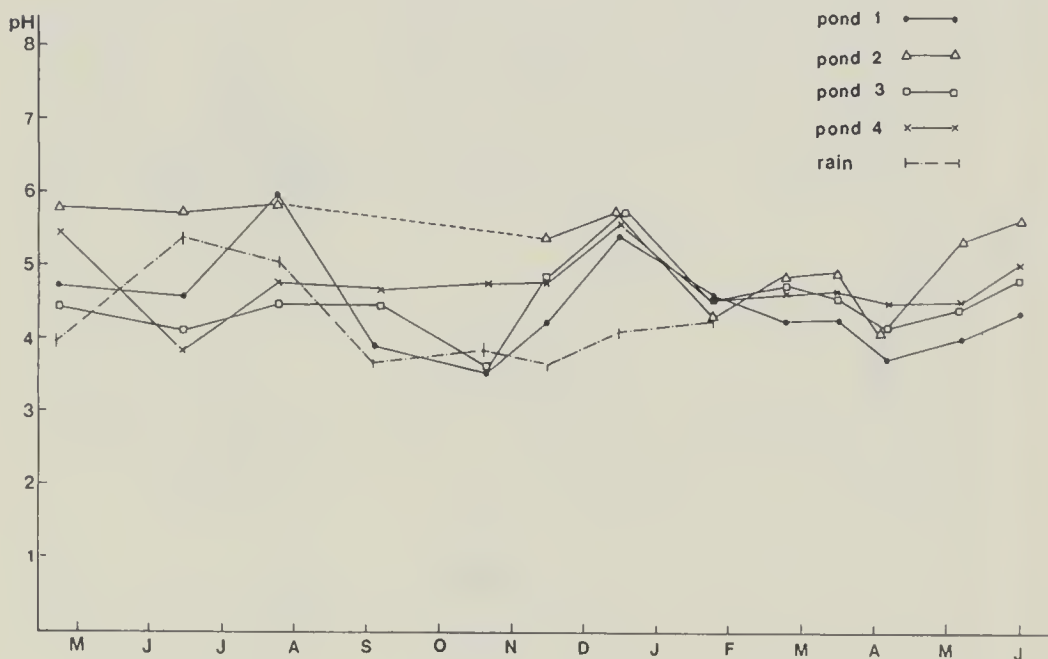


FIG. 5. Variation of pH at Wake Arms Pits compared with pH of rain.

DEERSHELTER PLAIN PONDS

The ponds at Deershelter Plain are small gravel pits, not deeper than 0.5 m. Pond 2 was dry most of the time during summer and early autumn, while pond 1, slightly bigger, was never dry. The pH of the water (Figure 6) was lower than at Wake Arms Pits, the range being between 3.0 and 5.3 (Table 2.0). The comparison between May 1986 and May 1987 showed a decrease in pH, which corresponds to the drop in pH at Wake Arms Pits in April 1986 (Table 3.4).

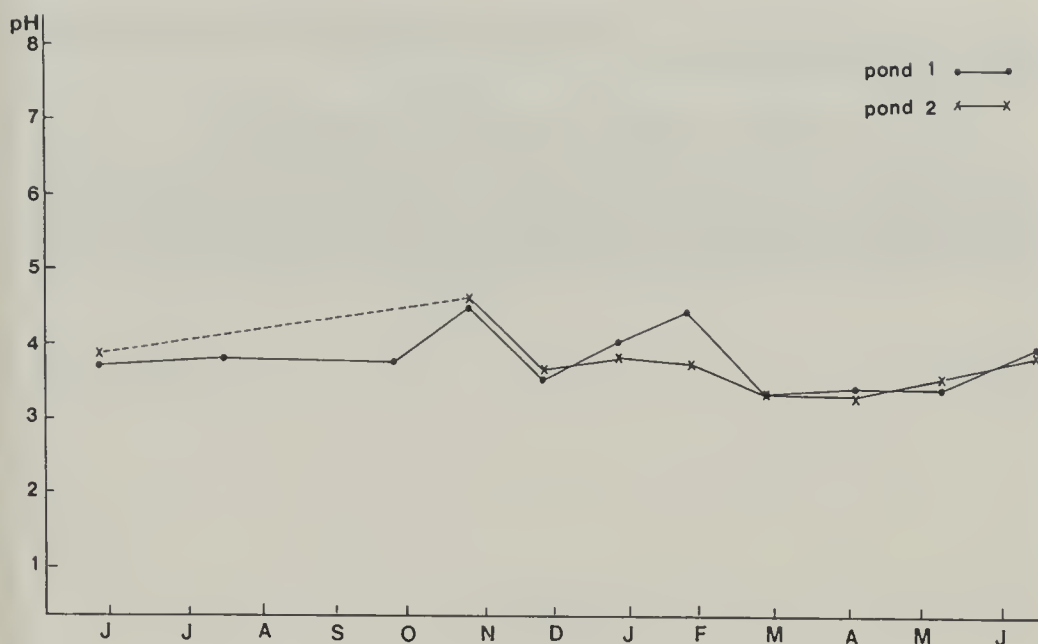


FIG. 6. Variation of pH at Deershelter Plain Ponds.

TABLE 3.4. The variation in mean pH and mean temperature of Deershelter Plain ponds between May 1986 and May 1987.

		May 1986	May 1987
Pond 1	mean pH	3.70	3.19
Pond 2	mean pH	3.86	3.34
Pond 1	mean T°C	14.30	12.60
Pond 2	mean T°C	15.16	12.50

Figure 7 illustrates that the pH variation was still affected by the water table. One can see the slight divergence of pH when the water table was low (high

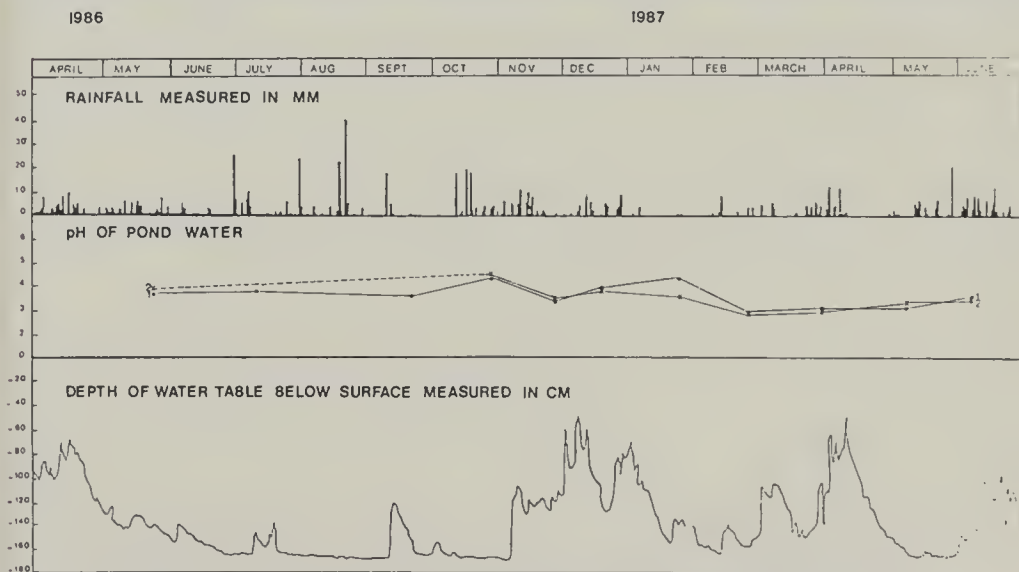


FIG. 7. Rainfall, pH of Deershelter Plain Ponds and depth of water table.

standard deviation) opposed to the convergence of pH when the water table was high (low standard deviation) (November and December 1986, February and March 1987).

The water temperature (Figure 8) followed the weather conditions and the air temperature. In spite of the small size of the ponds, neither of them ever froze over. The water surface temperature was always above freezing point, even during February, when the surface was frozen on the larger ponds at Wake Arms Pits. A possible answer to this could be that the ground water at Deershelter Plain acted as a reservoir of heat, maintaining the ponds' water above freezing point.

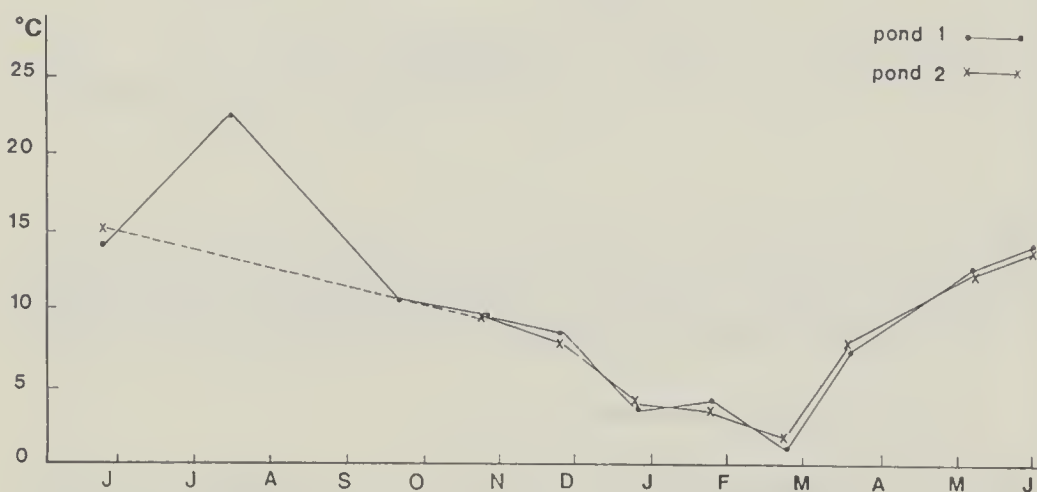


FIG. 8. Variation in temperature at Deershelter Plain Ponds.

The comparison between the water temperature in May 1986 and May 1987 (Table 3.4) showed a drop of about 2°C, also in this case the adverse weather conditions affected the ponds' water.

STRAWBERRY HILL GRAVEL PIT

The pH at Strawberry Hill Gravel Pit (Figure 9) tended to be more neutral than at the other sites, but the general pH pattern seemed to follow the other locations.

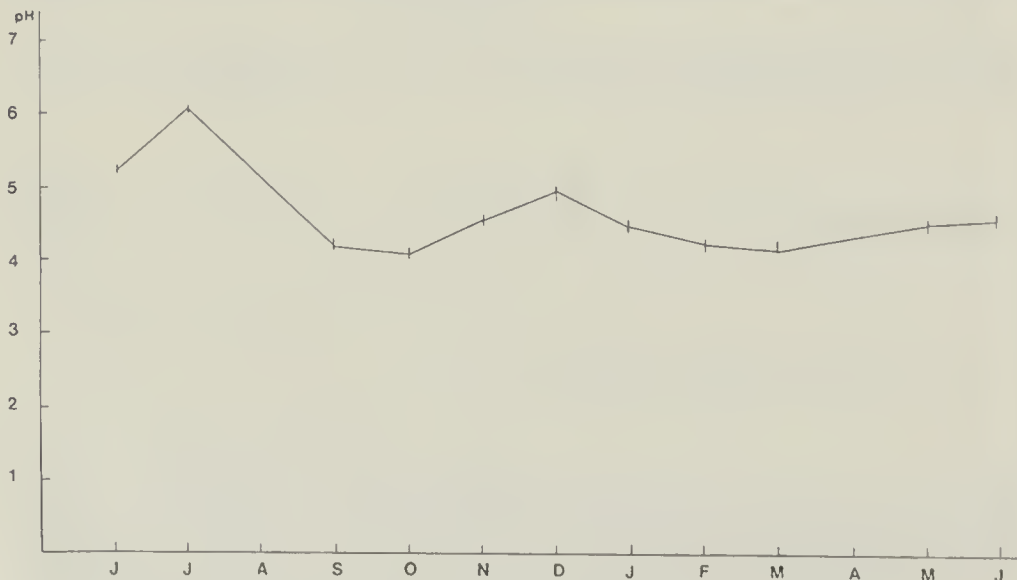


FIG. 9. Variation in pH at Strawberry Hill Gravel Pit.

TABLE 3.5. The variation in mean pH and mean temperature of Strawberry Hill Gravel Pit between June 1986/87 and May 1987.

	June 1986	June 1987	May 1987
Mean pH	5.23	4.60	4.55
Mean T°C	14.75	14.09	12.12

The comparison between June 1986 and June 1987 (Table 3.5) showed a drop in pH, as experienced for the other surveyed water bodies, but the pH increased if June 1987 was compared with May 1987, the reason always being the high rainfall. Also at this location there was a temperature drop (Figure 10, Table 3.5) when

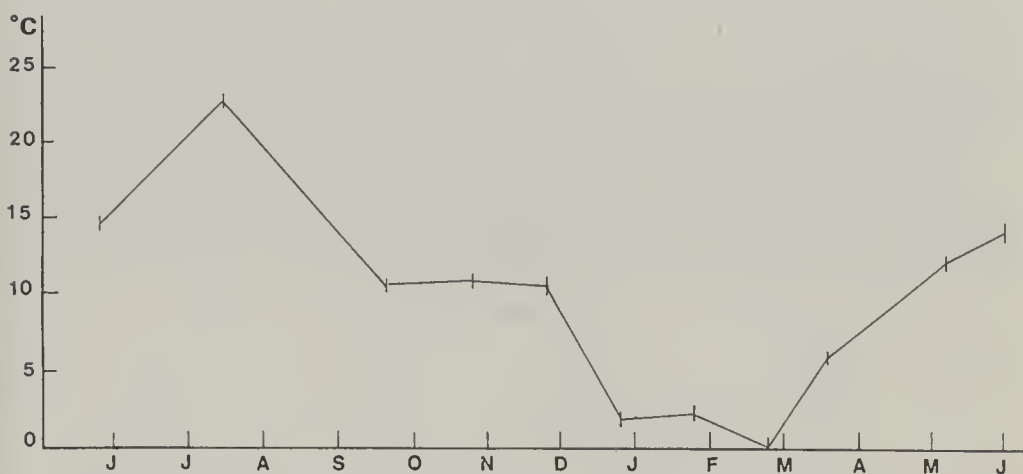


FIG. 10. Variation in temperature at Strawberry Hill Gravel Pit.

June 1986 was compared with June 1987. This was again due to the adverse weather conditions of late spring 1987. In February 1987 most of the water surface was frozen, but the temperature promptly rose in March. Figure 11 illustrates that, when the water table was low, the pH of the gravel pit was more variable. The pH stabilised when the water table rose (from January 1987 onwards).

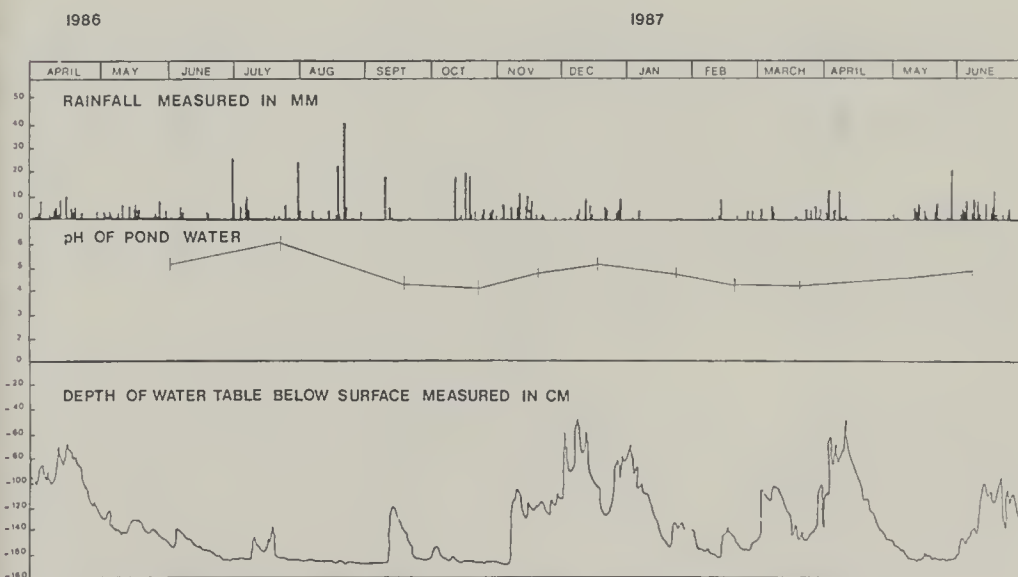


FIG. 11. Rainfall, pH of Strawberry Hill Gravel Pit and depth of water table.

Botanical Survey

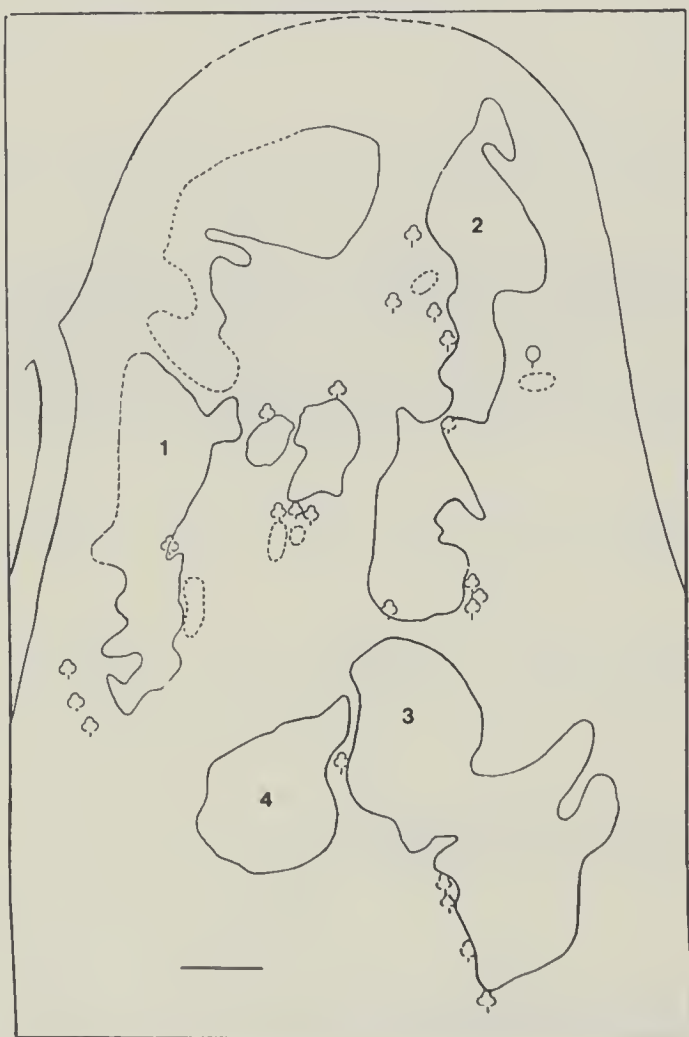
WAKE ARMS PITS. Map 1.

The species list was compiled during the months of the survey and involved several visits to the site (Table 4.0).

In this list white water lily *Nymphaea alba* was introduced by persons unknown in Ponds 3 and 4, common duckweed *Lemna minor* was introduced in the same way in Pond 4 as a contaminant of the white water lily and a *Lobelia* sp., found in Pond 4, was probably a garden escape.

There were 21 species found in all ponds and these were either common trees and grasses found in other sites of Epping Forest or typical acid-loving species like the rush family. There were 24 species common to Ponds 3 and 4, of which 21 were found in all ponds, two, *Juncus bulbosus* and *Rumex obtusifolius* were common to Ponds 1, 3 and 4 and one, the white water lily was introduced. There were eight species found only in Ponds 1 and 4. There were seven species exclusive to Pond 2.

Pond 1 had the greatest number of species, as one would expect, being older than Ponds 3 and 4. Pond 1 must have been more exposed to colonization than Pond 2 during its life history, as the latter had a smaller number of species. Pond 2 was surrounded by a woodland of beech and oak trees and underwent various



MAP 1. Wake Arms Pits showing Ponds 1-4. Scale line equals 10 metres.

stages of drying up during the year. This precarious condition could explain the reduction in the number of species. Besides there were seven species found only in Pond 2 and this was due mainly to the quite different environment that the pond offered to the vegetation. The water pH was closer to neutral than the other ponds and the bottom was mainly sealed. Pond 4 had 39 species (36 if the introduced plants were not considered) and this was quite a high total considering the relatively small size and age of the pond. The proximity to Pond 1 could be the explanation of this fast invasion by vegetation and a possible proof of this was that eight species were common only to these two ponds. Ponds 3 and 4 were in an open position and therefore in a favourable situation for colonization by vegetation. Pond 3 had a larger area of open water than Pond 4 and this could mean that it had taken longer for the plants to spread throughout the pond. The vicinity of Pond 4 to Pond 1 and its smaller size have made it easier than Pond 3 to colonize and cover with vegetation.

In July 1986 Ponds 1, 3 and 4 were invaded by *Juncus* spp.: soft rush *Juncus effusus* was mainly present on the banks and on the more marshy parts, bulbous rush *J. bulbosus* invaded the open shallow giving a characteristic reddish colour to the water. These were very strong acidophilic species. Floating sweet grass *Glyceria fluitans* competed with the soft rush on the banks and dominated in some patches, particularly in Ponds 1, 2 and 3. Wavy hair grass *Deschampsia flexuosa* and purple moor grass *Molinia caerulea* dominated on the drier parts of the banks, with some patches of purple moor grass moving towards the more boggy areas; these were also acidophilic species. Bittersweet *Solanum dulcamara* was confined to some sectors of Ponds 1 and 2, great reedmace *Typha latifolia* was confined to Pond 1. There was a patch of starwort *Callitriche* sp. in Pond 3 and a patch of common duckweed *Lemna minor* on the muddy bottom of Pond 2.

In September 1986 the species were unchanged but the growth was more prolific. This was true above all for the bulbous rush, the soft rush and the floating sweet grass. The water figwort *Scrophularia auriculata* and the rosebay willowherb *Chamerion angustifolium* invaded the banks of Pond 1 and species such as many-seeded goosefoot *Chenopodium polyspermum*, sharp dock *Rumex conglomeratus*, broad-leaved dock *R. obtusifolius*, redshank *Polygonum persicaria* and water pepper *P. hydropiper* were located on the bank of Pond 4.

These plants are typical of waste places, disturbed ground and wet places and can grow and adapt very quickly.

In November 1986 the growth was denser still, but there were no great changes in the distribution, new colonies not being formed. The bulbous rush moved towards the centre of Pond 3 and colonized all of Pond 4.

Floating sweet grass moved into the centre of Pond 1 and other plants like herb Robert *Geranium robertianum*, creeping buttercup *Ranunculus repens* and coltsfoot *Tussilago farfara* were located in the same pond.

In May 1987 the growth in the ponds was not as dense as the previous November, but the soft rush seemed well established mainly on the banks of Ponds 1, 3 and 4. Pond 1 was partly covered by a green alga (probably *Rhizoclonium* sp.), starwort *Callitriche* sp. had appeared in Ponds 1 and 4 and bittersweet *Solanum dulcamara* had colonized the bank of Pond 4. *Salix* spp. appeared on the bank of Ponds 1 and 3.

In July 1987 the growth of the bulbous rush in Ponds 3 and 4 was so dense that the identification of other aquatic species was made almost impossible. The soft rush extended its range on the banks of the newly created ponds. The entire site was overgrown with Yorkshire fog *Holcus lanatus* dominating the sward. Creeping thistle *Cirsium arvense*, water figwort and rosebay willowherb seemed to dominate the drier areas, while birch seedlings had invaded areas on the banks of Ponds 1 and 3. Great reedmace had colonized another site on the bank of Pond 1, floating sweet grass had increased in Pond 1 and had moved into Pond 4. The growth of the grass made it more difficult to locate other plants.

The comparison between July 1986 and July 1987 shows an increase in the growth of the rushes in the ponds and on the banks. Floating sweet grass seemed to become more dominant in Pond 1 (July 1987) where the soft rush was dominant a year previously and was invading Pond 4. All the species occurring in July 1986 had increased in July 1987 and some of them had extended to other areas of the site.

Below each pond is analysed separately.

Pond 1 tended to dry up in most places during summer and the growth was dense. During the sixteen months of observation the main vegetation which covered most of the area of the pond, in the approximate order of abundance, was: 1) *Juncus effusus*, 2) *J. bulbosus*, 3) *Glyceria fluitans*, 4) *Molinia caerulea*.

Pond 2 dried up completely in summer and early autumn if the weather conditions were slightly dry, like the summer and autumn of 1986. The vegetation dominance was, in order of abundance: 1) *Glyceria fluitans* = *Molinia caerulea* = *Deschampsia flexuosa*, 2) *Solanum dulcamara* = *J. effusus*, 3) *Cirsium arvense*. It is interesting to notice the absence of *J. bulbosus*, since this species requires very acid water. Pond 3 never dried up during the year. *J. bulbosus* colonized a significant section of the pond earlier in the year (July) in 1987 than it had done in 1986 (October/November). *Callitriche* sp. extended its range from one area to two (the location of this species was difficult in July 1987 because of the dense growth of the bulbous rush). *J. effusus* moved in at one end of the pond and was generally dominant on the banks together with *Molinia caerulea*. The vegetation dominance was, in order of abundance: 1) *J. bulbosus*, 2) *J. effusus*, 3) *Molinia caerulea*, 4) *Glyceria fluitans*. Pond 4 dried up in places in summer and autumn 1986. Here as well the invasion of the bulbous rush was seasonal and its growth denser in July 1987 than in July 1986. The soft rush always dominated on the banks and the floating sweet grass appeared in the pond in June/July 1987. The vegetation dominance was, in order of abundance: 1) *J. bulbosus*, 2) *J. effusus*, 3) *Molinia caerulea*.

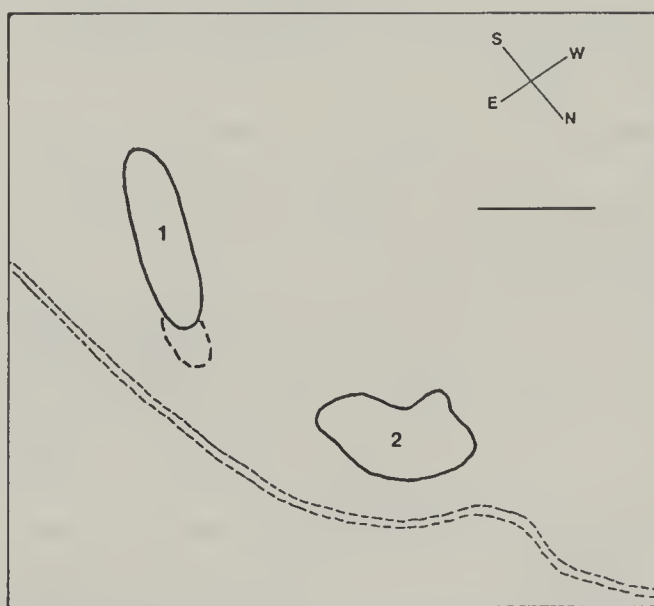
TABLE 4.0. Flora of Wake Arms Pits.

		POND			
		1	2	3	4
<i>Agrostis stolonifera</i>	creeping bent	—	+	+	—
<i>Arctium minus</i>	lesser burdock	—	—	+	—
<i>Betula pendula</i>	silver birch	+	+	+	+
<i>Callitriche</i> spp.	starwort	+	+	+	+
<i>Calluna vulgaris</i>	heather	+	—	—	—
<i>Cardamine flexuosa</i>	wavy bittereress	+	—	—	+
<i>Carex remota</i>	remote sedge	—	—	—	+
<i>Carpinus betulus</i>	hornbeam	—	+	—	—
<i>Chamerion angustifolium</i>	rosebay willow-herb	+	+	+	+
<i>Chenopodium polyspermum</i>	many-seeded goosefoot	+	—	—	+
<i>Cirsium arvense</i>	creeping thistle	+	+	+	+
<i>Conyza canadensis</i>	Canadian fleabane	—	—	—	+
<i>Crataegus monogyna</i>	hawthorn	—	+	—	—
<i>Deschampsia caespitosa</i>	tufted hair-grass	+	—	—	—
<i>D. flexuosa</i>	wavy hair-grass	+	+	+	+
<i>Epilobium ciliatum</i>	American willow-herb	+	+	+	+
<i>E. palustre</i>	marsh willow-herb	+	+	+	+
<i>Fagus sylvatica</i>	beech	+	+	+	+
<i>Galium palustre</i>	common marsh-bedstraw	+	—	—	—
<i>Geranium dissectum</i>	cut-leaved cranesbill	+	—	—	—
<i>G. robertianum</i>	herb Robert	+	—	—	+
<i>Glyceria fluitans</i>	floating sweet-grass	+	+	+	+
<i>Hieracium perpropinquum</i>	hawkweed	—	+	—	—
<i>Holcus lanatus</i>	Yorkshire fog	+	+	+	+
<i>H. mollis</i>	creeping soft-grass	+	+	+	+
<i>Ilex aquifolium</i>	holly	+	+	+	—
<i>Juncus acutiflorus/articulatus</i>		+	—	—	—

		1	2	3	4
<i>J. bulbosus</i>	bulbous rush	+	–	+	+
<i>J. effusus</i>	soft rush	+	+	+	+
<i>J. inflexus</i>	hard rush	+	+	–	–
<i>Lemna minor</i>	common duckweed	–	+	–	+
<i>Lobelia</i> sp.		–	–	–	+
<i>Lolium perenne</i>	perennial rye-grass	+	–	–	–
<i>Lotus uliginosus</i>	large birdsfoot-trefoil	+	–	–	–
<i>Molinia caerulea</i>	purple moor-grass	+	+	+	+
<i>Nymphaea alba</i>	white water lily	–	–	+	+
<i>Plantago major</i>	great plantain	+	–	–	+
<i>Polygonum hydropiper</i>	water pepper	+	–	–	+
<i>P. persicaria</i>	redshank	+	–	–	+
<i>Potamogeton</i> sp.	pondweed	–	–	+	–
<i>Potentilla erecta</i>	common tormentil	+	–	–	+
<i>Prunus spinosa</i>	blackthorn	–	+	–	–
<i>Pteridium aquilinum</i>	bracken	–	+	+	–
<i>Quercus robur</i>	common oak	+	+	+	+
<i>Ranunculus flammula</i>	lesser spearwort	+	+	+	+
<i>R. repens</i>	creeping buttercup	+	+	+	+
<i>Ribes nigrum</i>	blackcurrant	–	+	–	–
<i>Rubus fruticosus</i>	blackberry	+	+	+	+
<i>Rumex conglomeratus</i>	sharpdock	+	+	+	+
<i>R. obtusifolius</i>	broad-leaved dock	+	–	+	+
<i>Salix caprea/cinerea</i>	sallow	+	+	+	–
<i>Scrophularia auriculata</i>	water figwort	+	+	+	+
<i>Solanum dulcamara</i>	bittersweet	+	+	+	+
<i>Teucrium scorodonia</i>	woodsage	–	+	–	–
<i>Tussilago farfara</i>	coltsfoot	+	–	–	+
<i>Typha latifolia</i>	great reedmae	+	–	–	–
<i>Ulex europaeus</i>	common gorse	+	+	+	+
<i>Urtica dioica</i>	stinging nettle	+	+	–	+
<i>Veronica filiformis</i>	slender speedwell	–	–	–	+
<i>V. serpyllifolia</i>	thyme-leaved speedwell	–	–	–	+
Total		43	34	30	39

*Introduced

DEERSHELTER PLAIN PONDS. Map 2.



MAP 2. Deershelter Plain Ponds 1 and 2. Scale line equals 10 metres.

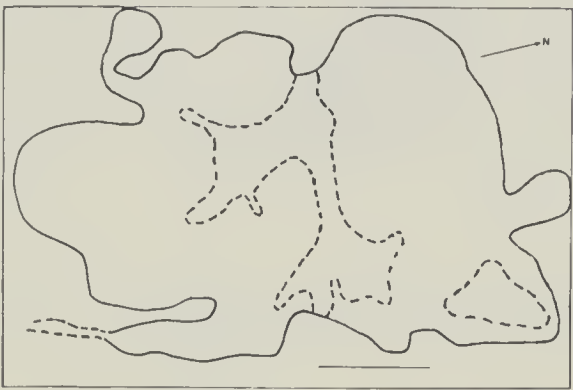
Table 4.1 is a list of species occurring in the ponds and on the banks. It was compiled as for Wake Arms Pits. The plants were mainly acid-loving species, needing very wet soil.

In June 1987 the bulbous rush dominated the water at this site and the soft rush occurred on the banks, surrounded by purple moor grass and bracken *Pteridium aquilinum*.

TABLE 4.1. Flora of Deershelter Plain Ponds.

		Pond 1	Pond 2
<i>Betula pendula</i>	silver birch	+	+
<i>Deschampsia flexuosa</i>	wavy hair-grass	+	+
<i>Juncus bulbosus</i>	bulbous rush	+	+
<i>J. effusus</i>	soft rush	+	+
<i>Molinia caerulea</i>	purple moor-grass	+	+
<i>Potentilla erecta</i>	common tormentil	+	—
<i>Pteridium aquilinum</i>	bracken	+	+
<i>Quercus robur</i>	common oak	+	+
<i>Salix cinerea</i>	common willow	+	—
BRYOPHYTES			
<i>Sphagnum</i> sp.		+	—
Total		10	7

STRAWBERRY HILL GRAVEL PIT. Map 3.



MAP 3. Strawberry Hill Gravel Pit. Scale line equals 10 metres.

Table 4.2 shows the species found in this pit and it was compiled in the same way as for the other sites. A total of 26 species was identified and of these 18 were common to the other surveyed sites.

In June 1986 the dominant species on the marshy parts were floating sweet grass and soft rush. The willow carr covered a large area on the northern side of the pit, with some patches on the southern side. The yellow flag *Iris pseudacorus* covered a consistent part of the southern side. In the open water the starwort dominated, bracken and birch seedlings invaded the dry land, while two interesting species were located on the southern and eastern side, purple loosestrife *Lythrum salicaria* and bogbean *Menyanthes trifoliata*.

In July 1987. Some changes were noted. The willow carr increased on the southern side but decreased on the northern. The soft rush extended where the floating sweet grass had dominated in June 1986. The bracken growth was denser on the dry island and on the banks. The yellow flag area was larger than in June 1986. Rosebay willowherb was located in the willow carr, a pondweed *Potamo-*

mogeton sp. was located in the open water with the starwort, and marsh pennywort *Hydrocotyle vulgaris* was also found in the *Sphagnum* bog.

TABLE 4.2. Flora of Strawberry Hill Gravel Pit.

<i>Acer pseudoplatanus</i>	sycamore
<i>Betula pendula</i>	silver birch
<i>Callitriche</i> sp.	starwort
<i>Calluna vulgaris</i>	heather
<i>Carpinus betulus</i>	hornbeam
<i>Castanea sativa</i>	sweet chestnut
<i>Deschampsia flexuosa</i>	wavy hair-grass
<i>Fagus sylvatica</i>	beech
<i>Glyceria fluitans</i>	floating sweet-grass
<i>Holcus lanatus</i>	Yorkshire fog
<i>H. mollis</i>	creeping soft-grass
<i>Hydrocotyle vulgaris</i>	marsh pennywort
<i>Ilex aquifolium</i>	holly
<i>Iris pseudacorus</i>	yellow flag
<i>Juncus effusus</i>	soft rush
<i>Lythrum salicaria</i>	purple loosestrife
<i>Menyanthes trifoliata</i>	bogbean
<i>Molinia caerulea</i>	purple moor-grass
<i>Nardus stricta</i>	mat-grass
<i>Potamogeton</i> sp.	pondweed
<i>Pteridium aquilinum</i>	bracken
<i>Quercus robur</i>	common oak
<i>Rhododendron</i> sp.	
<i>Rubus fruticosus</i>	blackberry
<i>Salix caprea</i>	goat willow
<i>Solanum dulcamara</i>	bittersweet

BRYOPHYTES

Cephalozia connivens
Sphagnum fimbriatum
S. palustre

Detailed vegetation maps for each of the above sites are available at the Epping Forest Conservation Centre.

Conclusions

The factors influencing the succession in a pond are various. Firstly the size and the age are directly proportional to the number of species, but there is a minimum size below which the correlation of the number of species with age is not valid (Selby 1954). Secondly the depth of water is important because it is reduced by the continual laying down of detritus of various forms such as leaf litter or other rotting material and by soil (this may have happened in Pond 2 at Wake Arms Pits). Plant rhizomes also compete for the settlement at different depths. *Potamogeton* spp. occupy the deepest parts, *Typha latifolia* those of intermediate depth, various species of *Juncus* the shallow water and *Lemna* spp. the water surface. Thirdly the competition of aerial and underground structures has an influence on the succession, as some plants grow more densely than others and do not allow other species to survive (Selby 1954).

All these factors certainly influenced the sites studied. The colonization by the vegetation at Wake Arms Pits was found to be dependent upon time and space; this meant that some plants were quicker colonizers than others and could spread out on larger areas.

The quickest colonizers were the *Juncus* spp., followed by grasses like floating sweet grass and purple moor grass. Common species of waste and wet places such as many-seeded goosefoot and sharp dock succeeded on the drier parts of the banks. Water- and emergent plants like starwort, common duckweed and great reed-mace were slower colonizers, needing more time to establish themselves and to extend to new areas of the site.

Acknowledgements

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APPENDIX 1.0 pH at Wake Arms Pits.

Sites of sampling	1986							1987						
	April	June	July	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	
Pond 1														
1	6.4	5.3	6.9	3.8	3.9	4.7	5.9	5.4	3.9	4.1	4.1	4.1	4.6	
2	4.2	5.2	6.2	4.1	3.8	3.9	5.3	4.9	3.7	3.8	3.7	3.7	4.7	
3	3.9	4.5	5.3	—	4.2	4.2	5.4	4.8	4.2	4.1	3.1	3.5	3.5	
4	4.2	4.7	5.7	—	3.25	3.9	5.1	4.7	3.8	3.8	4.1	3.7	4.1	
5	3.9	4.2	6.1	—	3.2	4.1	5.8	4.7	4.4	4.5	3.9	4.6	4.7	
6	4.1	3.8	—	—	3.4	4.4	5.8	4.8	4.7	5.3	3.6	4.3	4.7	
7	5.0	4.7	—	—	3.15	4.0	5.35	4.7	4.7	4.5	3.6	4.9	4.5	
8	4.9	3.5	—	—	3.8	4.5	5.5	4.6	4.7	4.0	3.7	3.9	4.2	
9	5.8	4.4	—	—	—	4.6	6.3	4.5	4.9	5.5	4.9	4.9	5.7	
10	4.8	5.7	—	—	—	4.4	5.0	4.7	4.3	3.8	3.3	3.5	3.6	
11	4.9	—	—	—	—	—	—	3.8	—	—	—	—	—	
12	4.8	—	—	—	—	—	—	—	—	—	—	—	—	
Pond 2														
1	5.6	5.1	5.9	—	—	5.7	6.2	4.5	4.8	5.1	4.5	5.2	5.7	
2	5.7	5.85	—	—	—	5.2	6.3	4.5	5.0	5.0	4.3	5.1	5.4	
3	5.9	5.8	—	—	—	—	5.6	4.5	4.8	5.0	4.2	5.4	5.8	
4	5.9	6.0	—	—	—	—	5.5	4.2	4.6	4.8	3.8	5.4	5.7	
5	5.6	5.6	—	—	—	—	5.4	4.5	4.7	5.0	4.0	5.1	5.6	
6	5.9	5.8	—	—	—	—	—	4.5	4.6	5.0	4.0	5.5	5.5	
7	6.0	5.7	—	—	—	—	—	4.3	4.6	4.7	4.1	5.6	5.7	
8	5.8	5.9	—	—	—	—	—	4.4	5.3	4.6	4.2	5.6	5.8	
9	5.9	5.95	—	—	—	—	—	4.4	—	4.65	4.7	5.5	6.1	
10	5.9	5.9	—	—	—	—	—	—	—	—	5.3	5.0	5.95	
11	5.8	5.5	—	—	—	—	—	—	—	—	—	—	—	
12	5.7	5.85	—	—	—	—	—	—	—	—	—	—	—	
13	5.7	6.35	—	—	—	—	—	—	—	—	—	—	—	
14	6.0	5.5	—	—	—	—	—	—	—	—	—	—	—	
Pond 3														
1	4.4	4.05	4.2	4.5	3.6	5.2	6.0	4.7	4.6	5.1	4.5	4.8	5.25	
2	4.3	4.4	4.7	4.5	3.7	5.0	5.9	4.7	4.5	5.0	4.3	4.6	5.0	
3	4.2	4.23	4.3	4.7	3.9	4.7	6.1	4.7	4.3	4.8	4.0	4.6	5.0	
4	4.0	4.2	4.5	4.6	3.75	4.9	5.85	4.7	4.7	4.7	3.9	4.5	4.9	
5	4.5	4.19	4.7	4.7	3.5	4.8	5.7	4.5	4.9	4.5	3.9	4.5	4.9	
6	4.5	4.2	4.5	4.8	3.85	4.9	5.85	4.6	4.7	4.5	3.8	4.5	5.1	
7	4.8	4.4	4.5	4.3	3.75	4.9	5.8	4.7	4.7	4.5	4.7	4.4	4.8	
8	4.5	3.7	4.2	4.3	3.7	4.9	5.4	4.5	4.9	4.6	4.6	4.3	4.9	
9	4.4	3.95	4.7	4.4	3.55	5.0	5.8	4.6	4.7	4.5	4.5	4.4	4.8	
10	4.5	4.1	4.7	4.5	3.4	4.9	5.7	4.65	4.9	4.6	4.2	4.4	4.7	
11	4.6	4.05	4.8	4.4	3.7	4.8	5.7	4.6	4.8	4.7	4.6	4.5	4.8	

Pond 4

1	6.4	3.5	5.1	4.9	5.6	5.0	5.9	4.8	4.7	4.9	4.8	4.7	5.5
2	5.6	4.05	4.9	4.7	4.6	4.7	5.9	4.7	4.7	4.65	4.3	4.55	5.3
3	5.5	3.8	5.4	4.9	4.75	4.85	5.6	4.5	4.8	4.5	4.65	4.55	5.3
4	5.0	4.2	4.5	4.5	4.45	4.7	5.6	4.65	4.6	4.7	4.7	4.8	5.3
5	5.6	3.6	4.3	4.5	4.6	4.85	5.4	4.7	4.5	4.75	4.6	4.65	5.1
6	5.4	3.9	4.6	—	—	5.0	5.5	4.8	4.2	4.7	4.5	4.3	4.6
7	5.4	4.0	—	—	—	—	—	4.5	—	4.8	4.5	4.7	5.0

APPENDIX 1.1 pH at Deershelter Plain Ponds.

Sites of of sampling	1986 May	July	Sept.	Oct.	Nov.	Dec.	1987 Jan.	Feb.	Mar.	May	June
Pond 1											
1	3.55	4.0	3.45	4.4	3.6	4.2	5.3	3.3	3.3	3.3	3.7
2	3.55	3.75	3.6	4.3	3.5	3.9	4.5	3.3	3.0	3.2	3.63
3	3.85	3.65	4.3	4.5	3.4	3.8	4.3	3.0	3.2	3.15	3.66
4	3.6	3.6	3.45	4.4	3.45	3.8	3.7	3.2	3.3	3.25	3.76
5	3.85	—	—	—	3.2	3.8	3.8	3.0	3.4	3.05	3.65
Pond 2											
1	3.9	—	—	4.4	3.7	4.0	3.7	3.2	3.2	3.4	3.6
2	3.9	—	—	4.6	3.4	3.7	3.6	3.1	3.15	3.4	3.66
3	3.8	—	—	—	3.5	3.6	3.5	3.15	3.2	3.2	3.63

APPENDIX 1.2 pH at Strawberry Hill Gravel Pit.

Sites of of sampling	1986 June	July	Sept.	Oct.	Nov.	Dec.	1987 Jan.	Feb.	Mar.	May	June
1	5.25	6.1	5.3	4.15	5.0	5.8	4.6	4.8	5.1	4.3	4.9
2	5.3	—	4.4	4.7	4.8	5.1	4.8	4.7	4.9	4.8	4.3
3	5.35	—	4.5	3.6	4.75	5.35	4.8	4.9	4.65	4.7	4.6
4	5.5	—	3.7	4.3	4.9	5.1	4.6	4.8	4.1	3.8	4.5
5	5.55	—	3.9	4.45	4.8	4.8	4.5	3.6	4.0	3.8	4.0
6	5.1	—	4.2	4.2	4.1	4.8	4.35	4.2	4.0	5.35	4.2
7	4.95	—	3.9	4.15	4.75	5.1	4.7	4.0	4.65	5.25	4.8
8	5.55	—	3.8	4.15	4.1	5.0	4.8	4.7	4.5	—	5.7
9	5.5	—	—	4.15	4.7	4.6	4.0	3.3	3.35	—	3.9
10	5.45	—	—	3.95	4.6	4.8	4.5	4.0	3.1	—	—
11	3.5	—	—	3.75	4.3	4.85	4.2	3.7	3.9	—	4.72
12	5.85	—	—	—	4.4	5.1	4.5	4.0	4.2	4.4	5.03

APPENDIX 2.0 Average pH and temperature at Wake Arms Pits.

	Pond 1		Pond 2		Pond 3		Pond 4	
	pH mean	Temp. °C mean	pH mean	Temp. °C mean	pH mean	Temp. °C mean	pH mean	Temp. °C mean
April 1986	4.74	8.75	5.81	10.9	4.42	12.5	5.55	13.7
June	4.60	22.65	5.77	19.6	4.13	23.68	3.86	23.2
July	6.04	18.0	5.90	14.5	4.52	18.95	4.80	20.6
September	3.95	12.5	DRY	DRY	4.52	12.18	4.70	14.1
October	3.58	8.62	DRY	DRY	3.67	8.68	4.80	8.6
November	4.27	5.8	5.45	8.0	4.90	6.59	4.85	6.4
December	5.54	3.7	5.80	4.7	5.80	1.9	5.65	1.25
January 1987	4.69	2.72	4.43	2.61	4.63	2.09	4.66	2.85
February	4.33	-1.3	4.80	-0.18	4.70	-0.31	4.58	1.41
March	4.34	0.8	4.91	0.65	4.68	1.4	4.71	2.78
April	3.80	9.15	4.28	8.85	4.27	9.75	4.57	9.85
May	4.11	11.15	5.46	9.1	4.50	11.4	4.60	12.21
June	4.43	12.75	5.72	11.3	4.92	14.27	5.15	15.28
Total Mean	4.49		5.30		4.59		4.80	
Max.	6.04		5.90		5.80		5.65	
Min.	3.58		4.28		3.67		3.86	

APPENDIX 2.1 Average pH and temperature at Deershelter Plain Ponds and Strawberry Hill Gravel Pit.

	Deershelter Plain Ponds				Strawberry Hill Gravel Pit		
	Pond 1		Pond 2				
	<i>pH</i> <i>mean</i>	<i>Temp.</i> <i>°C mean</i>	<i>pH</i> <i>mean</i>	<i>Temp.</i> <i>°C mean</i>		<i>pH</i> <i>mean</i>	<i>Temp.</i> <i>°C mean</i>
May 1986	3.70	14.3	3.86	15.16	June 1986	5.23	14.75
July	3.75	22.25	DRY	DRY	July	6.10	23.0
September	3.70	10.25	DRY	DRY	Sept.	4.21	10.5
October	4.40	9.75	4.50	9.75	Oct.	4.14	11.0
November	3.43	8.3	3.53	8.0	Nov.	4.60	10.45
December	3.91	3.6	3.76	3.83	Dec.	5.03	2.0
January 1987	4.32	4.2	3.60	3.6	Jan. 1987	4.53	2.2
February	3.16	0.9	3.15	1.5	Feb.	4.22	—
March	3.24	7.28	3.18	7.8	March	4.20	6.14
May	3.19	12.6	3.34	12.5	May	4.55	12.12
June	3.68	14.3	3.63	14.16	June	4.60	14.09

APPENDIX 3.0 Wake Arms Pit.

	<i>pH mean of the four ponds</i>	<i>standard deviation of pH</i>	<i>water table mean (cm)</i>	<i>rainfall mean (mm)</i>	<i>pH of rain mean</i>
April 1986	5.13	0.65	89.0	2.21	3.98
June	4.59	0.84	158.5	0.51	5.35
July	5.31	0.76	152.9	2.11	5.08
September	4.39	0.39	158.16	0.90	3.67
October	4.01	0.67	147.5	2.53	3.84
November	4.86	0.48	93.4	2.58	3.66
December	5.69	0.12	104.66	1.87	4.09
January 1987	4.60	0.11	117.06	0.85	4.35
February	4.60	0.20	150.23	0.99	—
March	4.66	0.23	123.33	1.56	—
April	4.23	0.31	104.36	1.45	—
May	4.66	0.56	158.7	2.22	—
June	5.05	0.53	117.9	3.03	—

— Data not available

APPENDIX 4.0 Temperature °C at Wake Arms Pits.

[illegible]

Pond 2

1	12.0	19.0	14.5	—	—	8.0	4.5	3.0	0	1.5	9.0	9.0	11.5
2	10.5	19.0	—	—	—	8.0	4.5	3.5	0	1.0	9.0	9.0	11.5
3	11.0	19.5	—	—	—	—	4.5	3.0	0	0.5	8.5	9.0	11.0
4	11.0	18.0	—	—	—	—	5.0	2.0	0.5	0.5	9.0	9.0	11.0
5	10.0	18.0	—	—	—	—	5.0	2.5	−1.0	1.0	9.0	9.0	11.0
6	11.5	20.0	—	—	—	—	—	1.0	−1.0	0	8.5	9.0	11.0
7	10.0	20.5	—	—	—	—	—	2.5	−1.0	0	8.5	9.0	11.0
8	10.0	20.0	—	—	—	—	—	2.5	1.0	0.5	9.0	9.0	11.0
9	10.5	19.0	—	—	—	—	—	3.5	—	0.5	9.0	9.5	12.0
10	12.0	18.5	—	—	—	—	—	—	—	1.0	9.0	9.5	12.0
11	12.0	19.0											
12	10.5	20.0											
13	10.5	25.0											
14	12.0	20.0											

Pond 3

1	15.0	24.0	19.0	14.0	8.5	7.0	2.0	2.0	−0.5	1.0	9.5	11.0	14.0
2	12.0	25.0	19.0	12.0	8.0	6.5	1.0	2.0	−1.0	1.5	9.8	11.5	13.0
3	12.5	25.0	19.0	13.0	8.5	6.5	2.0	2.0	0	2.0	9.8	11.5	15.0
4	12.5	25.5	18.0	11.5	8.5	6.0	1.0	2.5	−1.0	1.5	9.8	10.5	13.5
5	11.5	24.5	17.0	11.0	8.5	6.0	3.0	2.5	−1.0	0	9.5	10.5	13.5
6	12.0	22.5	18.0	11.0	9.0	6.0	2.5	1.5	−1.0	1.0	9.8	11.0	14.0
7	12.0	21.0	18.0	11.5	9.0	7.0	3.0	2.5	−0.5	1.5	9.8	11.0	14.0
8	12.0	22.0	18.5	11.5	9.0	7.0	2.5	1.5	0	1.0	9.8	11.0	14.0
9	12.0	23.0	20.0	11.5	9.0	6.5	1.5	2.0	0	2.0	9.8	12.0	14.0
10	13.5	24.0	21.0	12.0	8.5	7.0	1.5	2.5	0.5	2.0	9.9	13.0	16.0
11	12.5	24.0	21.0	15.0	9.0	7.0	1.0	2.0	1.0	2.0	9.8	12.5	16.0

Pond 4

1	14.0	24.0	19.0	14.0	8.5	6.0	1.5	2.5	2.5	3.0	10.0	12.5	16.0
2	13.0	23.5	22.0	13.0	8.5	6.5	1.0	3.0	4.0	4.0	9.5	12.5	16.0
3	14.0	23.0	20.0	14.0	8.5	6.5	1.0	3.5	1.5	3.5	9.8	12.5	15.0
4	14.0	24.5	22.0	15.0	9.0	6.5	1.5	2.0	0.5	2.5	9.8	12.5	15.0
5	14.0	23.0	21.0	14.5	8.5	6.5	1.5	2.5	0	1.5	10.0	12.5	15.0
6	13.5	22.5	20.0	—	—	6.5	1.0	3.0	0	2.5	9.9	11.5	15.0
7	13.5	22.5	—	—	—	—	—	3.5	—	2.5	10.0	11.5	15.0

APPENDIX 4.1 Temperature °C at Deershelter Plain Ponds.

Sites of sampling	1986				1987								
	May	July	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	May	June		

Pond 1

1	14.5	22.0	10.0	9.5	8.5	4.0	4.5	2.0	7.0	13.0	14.0
2	14.5	22.0	10.5	9.0	8.5	4.0	4.5	1.0	7.0	13.0	14.0
3	14.5	22.0	10.5	9.5	8.0	3.5	4.0	0.5	7.9	13.0	14.5
4	14.5	23.0	10.0	11.0	8.0	3.5	4.5	1.0	7.0	13.0	14.0
5	13.5	—	—	—	8.5	3.0	3.5	0	7.5	11.0	15.0

Pond 2

1	—	—	—	9.0	7.5	4.0	3.0	1.0	7.0	12.5	14.0
2	—	—	—	10.5	8.5	4.0	4.0	2.0	8.5	12.5	14.0
3	—	—	—	—	8.0	3.5	4.0	1.5	7.9	12.5	14.5

APPENDIX 4.2 Temperature °C at Strawberry Hill Gravel Pit.

Sites of sampling	1986						1987					
	June	July	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	May	June	
1	15.0	23.0	10.0	10.5	10.0	3.0	2.5	-1.0	6.3	12.0	14.0	
2	13.5	—	10.5	11.0	11.0	1.0	2.0	-2.0	6.5	13.0	14.5	
3	14.5	—	10.5	11.0	10.0	1.0	0.5	-2.0	5.0	11.0	12.0	
4	15.0	—	10.5	11.0	10.0	1.0	1.0	-3.0	5.5	12.0	12.0	
5	14.0	—	10.5	11.0	11.0	1.5	2.0	-3.0	6.0	12.0	13.0	
6	15.0	—	10.5	11.0	11.0	2.0	2.5	-1.0	7.0	12.0	12.5	
7	15.0	—	10.5	11.0	10.0	4.0	3.0	-1.0	6.0	13.0	12.5	
8	14.5	—	11.0	11.0	10.0	2.5	3.0	1.0	6.5	—	13.0	
9	16.5	—	—	11.5	10.5	2.5	3.0	0	7.0	—	15.5	
10	15.0	—	—	11.5	11.0	2.5	3.0	-1.0	5.9	—	—	
11	14.0	—	—	10.5	11.0	2.0	3.0	-0.5	7.0	—	21.0	
12	15.0	—	—	—	10.0	1.0	1.0	-2.0	5.0	12.0	15.0	

Book Review

The Parks and Woodlands of London. By Andrew Crowe. Fourth Estate Ltd, London. 1987. 367pp. £7.95 (paperback only). ISBN 0-947795-61-8.

Andrew Crowe has produced a useful addition to the literature about London's parks and woodlands, though at first sight it appears to be of more interest to the historian than the naturalist.

The book does not claim to be comprehensive yet even a native of London may be unfamiliar with some of these green areas. Mr Crowe has selected what he considers to be for general interest 'the best or the most interesting one hundred of London's larger parks'. A reference section gives brief notes on a further two hundred, but even this total of 300 leaves out many popular and interesting open spaces, such as many of London's overgrown cemeteries which surely come into the category of woodlands today.

The author is apparently a naturalist, so the omission of features such as *Sphagnum* bogs at Hampstead Heath and Wimbledon Common is surprising. There are sketch-maps of some of the open spaces listed, but unfortunately these are poor, giving very limited information and in any case only cover less than a third of the main entries. More detail about the types of vegetation and the degree of naturalness would be useful.

The author also has the quaint idea that people in the Metropolis only travel by bus or train – no concession to the cyclist or motorist is made, either in the 'How to get there' section or in the maps. The availability of parking facilities for example is omitted in most entries. To get to Bostall Wood one is urged to take the train to Abbey Wood and walk up a footpath parallel to Knee Hill; the station, the footpath and the Hill are not marked on the sketch-map. The car parks off Bostall Hill are not marked.

However Mr Crowe does succeed in making up for these shortcomings by his clear sense of the struggle by ordinary Londoners to secure the preservation of and access to many important open spaces. He has detailed some of the more famous cases. An early law-breaker was the Duke of Bedford who tried to enclose part of Streatham Common with a wooden fence in 1794. He was opposed by the commoners, and as the author relates, 'by the same evening a hackney coach drove to the spot...six men (emerged) draped in black and with caps over their faces...(proceeded to) cut down the paled enclosure...and drove off'.

Other villains in the history of struggle for public access to London's open spaces are detailed; Lord Spencer (Putney Common), Sir Thomas Wilson (Hampstead Heath), Queen's College, Oxford (Bostall Heath), Lord Halifax (Bushey Park), the Dysart family (Ham Common). As these historical notes make clear, it has been the determination of ordinary Londoners that has succeeded in preserving so much open space in the capital. In appreciating London's diverse flora and fauna it is as well to keep this in mind – today many of our open spaces and natural areas are under increasing pressure. We owe it to earlier Londoners to stand as firm as they did.

J. EDWARD MILNER

Preliminary Observations on the Dynamics of Macro-Invertebrate Communities in two Epping Forest Streams

by S. BOREHAM,[†]* J. ROSTRON* and P. BIRCH*

Abstract

Selected physico-chemical characteristics and the macro-invertebrate benthos of two Epping Forest streams were sampled at fourteen sites in autumnal low-flow and spate conditions. The mean invertebrate communities were compared and three community types were identified. Attempts were made to relate the physico-chemical characteristics observed to the three community types. A possible sequence of change between community types was related to environmental variation. However one community type could not be explained using the available data.

Introduction

Two major tributaries of the River Roding in South-West Essex, Loughton Brook and Debden Brook, together drain a 13.3 km² section of the eastern slopes of the Epping Forest ridge. The headwater catchments of these streams drain a large proportion (> 95%) of deciduous woodland. Seasonal variations in discharge and leaf litter accumulation affect the physico-chemical characteristics of these streams. The effects of drought in summer are exacerbated by evaporative loss from the forest canopy (Newson 1979), while freezing in winter also occurs particularly where recent re-pollarding of bank-side trees has increased exposure to frosts.

Forested streams are often more acidic than those with unforested catchments (Roberts *et al.* 1983). The Epping Forest ridge is underlain by relatively neutral London Clay, but is capped with sands and gravels which give rise to acidic soils and drainage over much of the area. Any factor which promotes the accumulation of leaf litter, for example a rapid reduction in stream gradient, may result in conditions indistinguishable from organic pollution due to human activities (Hynes 1964).

In addition Boycott (1936) and Macan (1974) suggest that the decomposition of leaves by micro-organisms in the aquatic environment may produce harmful organic compounds. Woodland streams therefore present a potentially hostile environment for benthic macro-invertebrates. This study examines the dynamics of macro-invertebrate communities present in two Epping Forest streams and attempts to relate these to selected physico-chemical factors.

Methods and Materials

In October and November 1986, eight sample sites in the Loughton Brook catchment (sites 1 to 8; National Grid references TQ 418966 to 422982) and six sample sites on the Tippa Burn, in the upper part of the Debden Brook catchment known as Hangboy Slade (sites 9 to 14; National Grid references TQ 436984 to 431991) were investigated (Figure 1). Three 30-second kick samples of the macro-invertebrate benthos and field measurements of pH (using a KM 7000 meter and a Corning series 500 electrode), conductivity (using a WPA CM25 meter and probe) and dissolved oxygen (using a PTI-401 meter and a EIL 8012170 probe) were taken from each sample site during low-flow (October) and spate (November) conditions. Kick samples were taken from stable gravel riffles, using

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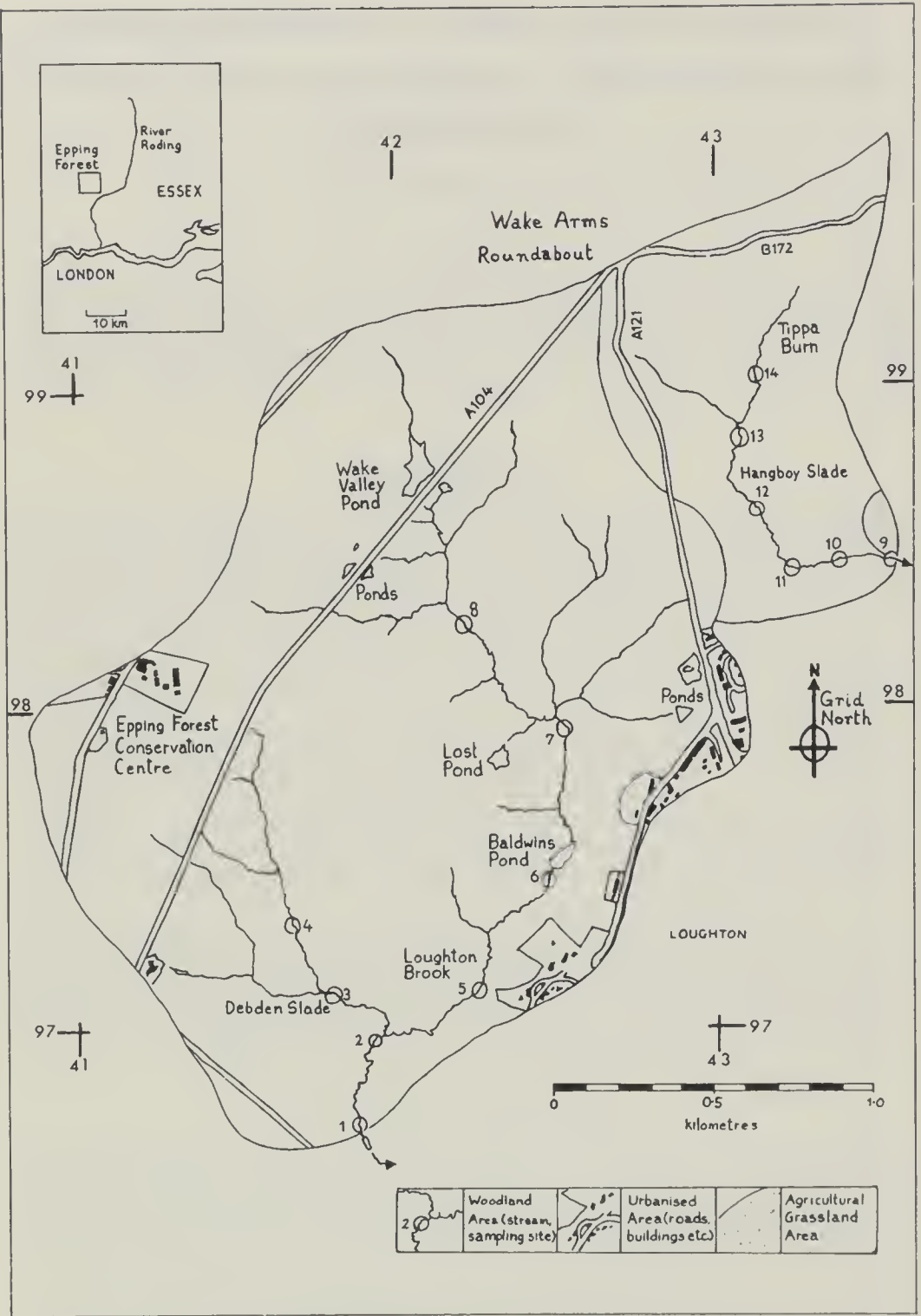


FIG. 1. Map of the study area.

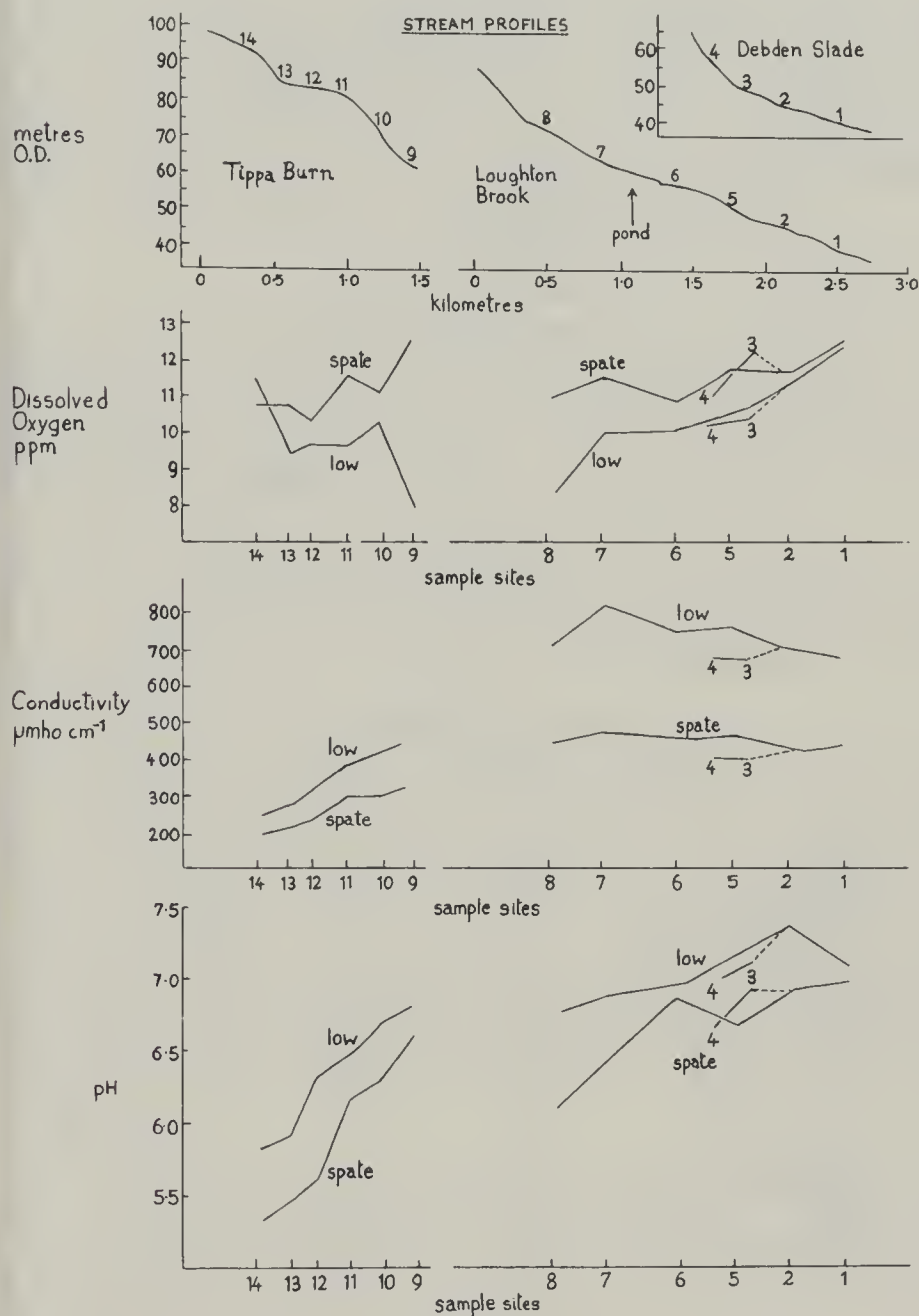


FIG. 2. Physico-chemical characteristics.

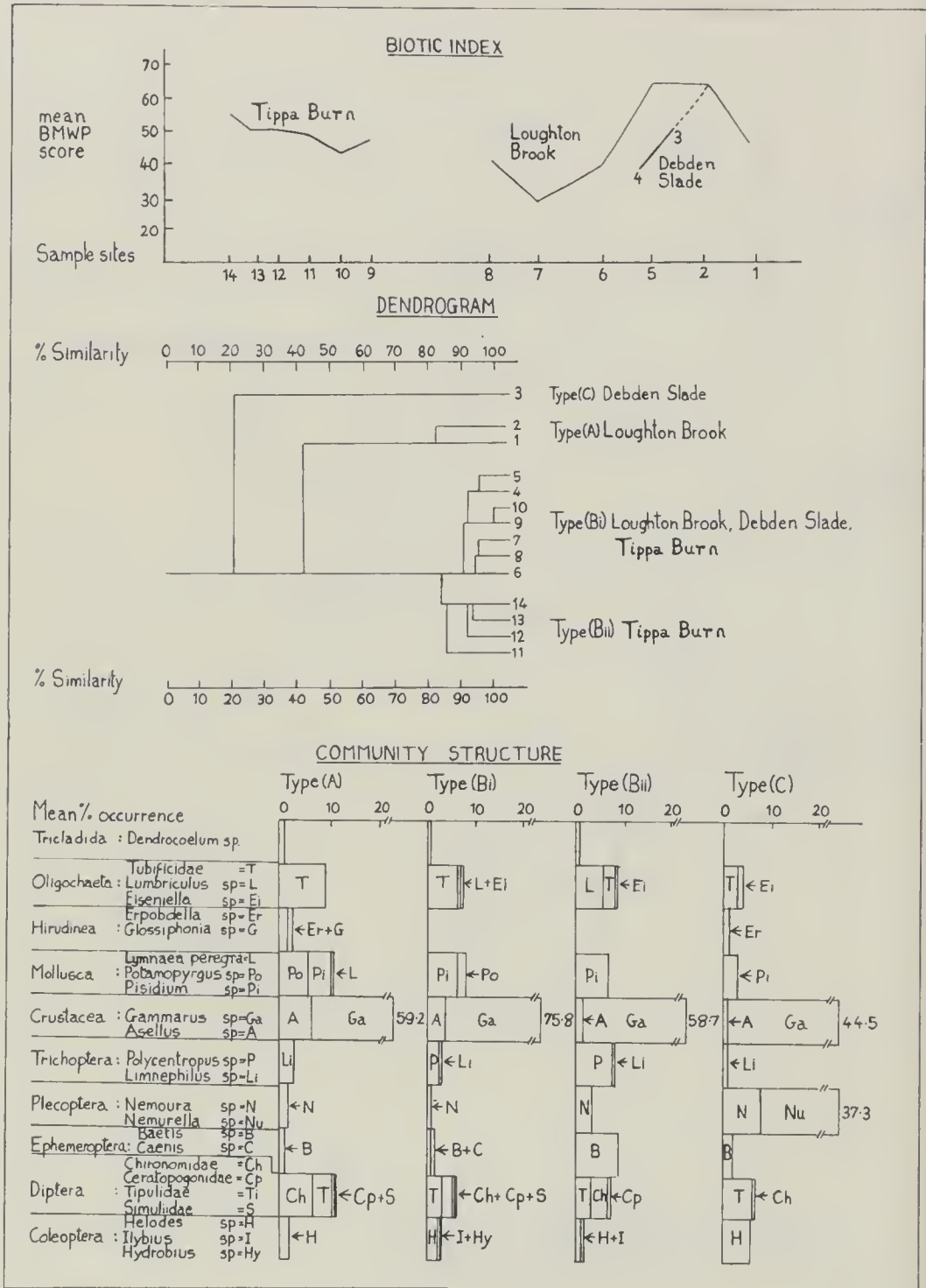


FIG. 3. Invertebrate communities.

a net with a mesh diameter of 250 μm and an opening 230 mm by 225 mm, adapted from Macan (1958).

The macro-invertebrates collected were field sorted and classified to species where possible and their numbers recorded. The GENSTAT 4.04 statistical package (Numerical Algorithms Group) was used to process the data. The mean invertebrate communities present in October and November were subjected to a factor analysis to extract three factors from the log mean numbers of each species present at each sample site. The three factors were used to construct a dendrogram using hierarchical average linkage cluster analysis of the euclidian distance between sample sites. A hydrobiological index, the BMWP score (National Water Council 1981) was also applied to the data.

Results and Discussion

Each stream profile and the physico-chemical data collected in low-flow (October) and spate (November) conditions are displayed in Figure 2. Tippa Burn was often more acidic and had lower conductivity than Loughton Brook, although similar physico-chemical trends were observed in both streams. In general, during the period of low-flow, conductivity was high with depressed levels of dissolved oxygen. However under spate conditions conductivity and pH were lower and levels of dissolved oxygen increased.

The mean BMWP score for each site, a dendrogram showing community similarities, and the structure of the community types identified are displayed in Figure 3. The BMWP score may be a useful indicator of leaf litter accumulation since it is relatively sensitive to organic pollution. However since many factors may influence this hydrobiological index, it is difficult to relate it to the physico-chemical characteristics observed.

Three distinct invertebrate community types, (A), (B) and (C) are identified by the dendrogram. Sample sites with community type (B) are more than 85% similar and form a large group from both catchments. However community type (A) was only 42% similar to the type (B) communities identified, and community type (C) at sample site 3 on Debden Slade was unique in having only a 21% similarity with other invertebrate communities.

The mean percentage occurrence of invertebrate groups in these types is used to show their different community structures. The crustacean *Gammarus pulex* numerically dominates the invertebrate fauna of all the sites investigated and it is the variation in other invertebrate groups which allows classification into community types. Community type (A) at sites 1 and 2 on Loughton Brook is distinguished by two species of leech (Hirudinea), three species of mollusc (including *Lymnaea peregra*) and a characteristic combination of other organisms.

It is possible to divide community type (B) into two sub-types. In community type (Bi), both species of leech and *Lymnaea peregra* were absent, although greater numbers of species were present in the Coleoptera, Ephemeroptera, Trichoptera and Oligochaeta when compared to community type (A). Community type (Bii) occurred at sample sites 11 to 14 on Tippa Burn and differed from type (Bi) in that *Lumbriculus* sp. was the main representative of the Oligochaeta, *Potamopyrgus jenkinsi* was absent from the Mollusca, and the Trichoptera, Plecoptera and Ephemeroptera were more abundant.

The most distinguishing feature of community type (C) was the large proportion of stoneflies (Plecoptera), particularly *Nemurella* sp. which occurred at no other sites. The other species present appear to show elements of both type (A) and type (B) communities.

The downstream stretch of Loughton Brook provides a well oxygenated, stable environment with approximately neutral pH and supports invertebrate commu-

ity type (A). However the overall structure of the invertebrate community in Loughton Brook and Tippa Burn can be best described by reference to community type (Bi). The sample sites giving type (Bi) communities although variable, have no distinguishing environmental characteristics. The smaller, well oxygenated but acidic headwaters of Tippa Burn give rise to a subtly different community type (Bii). Community type (C) at site 3 on Debden Slade is unique and no distinguishing physico-chemical characteristics were detected. It is possible that this may be a 'relict' community resulting from the past discharge of sewage from a public house into a small tributary of Debden Slade.

Conclusion

The limited physico-chemical data collected indicate that the two streams considered exhibit both spatial and temporal variation and have differing environmental regimes. However the three invertebrate community types identified can only be tentatively related to physico-chemical factors. The invertebrate communities may be envisaged as changing from type (Bii), characteristic of well-oxygenated and acidic headwater sites, to the more diverse community type (Bi) of sites which show a variety of environmental conditions.

A further community change from type (Bi) to type (A) appears to occur as the area drained exceeds approximately 3.5 km². The increased discharge allows dissolved oxygen levels and an approximately neutral pH to be maintained, and provides an increased number of micro-habitats. This results in a distinct change in the invertebrate community. Community type (C) was unique to one sample site and this cannot be attributed to the physico-chemical data that were recorded.

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Ecological Effects of a Major Insecticide Pollution on an Essex River

by P. J. RAVEN*

Summary

An accidental spillage of 500 litres of the organophosphorus insecticide Dursban 4E† formulated as 41% w/w chlorpyrifos emulsifiable concentrate polluted 20 km of the River Roding, Essex in April 1985, killing more than 90% of the fish population. The ecological impact of this unprecedented pollution and the recovery of a wide range of riverine biota were assessed during a two-year study. Aquatic arthropods were eliminated but the toxic effect on aquatic bacteria, algae, macrophytes, molluscs, annelids, breeding river-birds and water voles was probably negligible except in the extreme short-term. River water was no longer acutely toxic to the most susceptible arthropod taxa within 11 weeks of the spillage but isolated patches of contaminated sediment were still present after 120 weeks. The relative recovery rates of arthropod taxa varied considerably but recolonization was well advanced within 18 months. Following a full restocking of the fishery, the Roding ecosystem, with few minor exceptions, was restored to its pre-spillage status in little more than two years.

Introduction

Insecticides can enter rivers by deliberate application in order to eliminate nuisance taxa (e.g. biting midges, blackfly), contamination from agricultural or industrial activities in the catchment or accidental spillage (Muirhead-Thomson 1987). Major spillages can be potentially devastating to riverine wildlife, but due to their rare, unpredictable occurrence and relatively short-term effects, they have not previously been studied in detail. In 1985 there was a unique opportunity to assess the ecological impact of a major insecticide pollution of an Essex river and this paper summarizes the results of a two-year case study. More detailed information will appear in specialist journals.

The River Roding drains a clay catchment in western Essex (Figure 1). The habitat comprises fast-flowing shallows (riffles) and deep-water pools, but the channel has been substantially realigned and modified in places to accommodate motorway construction and flood alleviation schemes (Raven 1985). Although the upper and middle reaches support a good coarse fishery, water quality deteriorates in the lowermost reaches due to increased sewage effluent, urban and road runoff (Dearsley and Reeves 1978). In addition to routine biological monitoring by Thames Water Authority (T.W.A.), the middle reaches were extensively studied during 1974-82, particularly with respect to the ecological impacts of road runoff and river engineering. Consequently, there was good information on freshwater algae, particularly *Cladophora* (Stone 1981), aquatic and riparian vegetation (Raven 1986a, 1986b), riffle macroinvertebrates (Exterence 1978, Davis 1983, T.W.A. unpublished data), dragonflies (Raven 1985), fish (Dearsley and Reeves 1978), river-birds (Raven 1986c) and water voles (Raven 1985) prior to the April 1985 insecticide spillage.

Following a road traffic accident on April 2nd 1985, approximately 500 litres of the organophosphorus insecticide Dursban 4E, formulated as 41% w/w chlorpyrifos emulsifiable concentrate, spilled from the M11 motorway into Brookhouse Brook, a tributary of the Roding (Figure 1). Despite prompt reaction by T.W.A.

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†Dursban is a Tradename of the Dow Chemical Company.

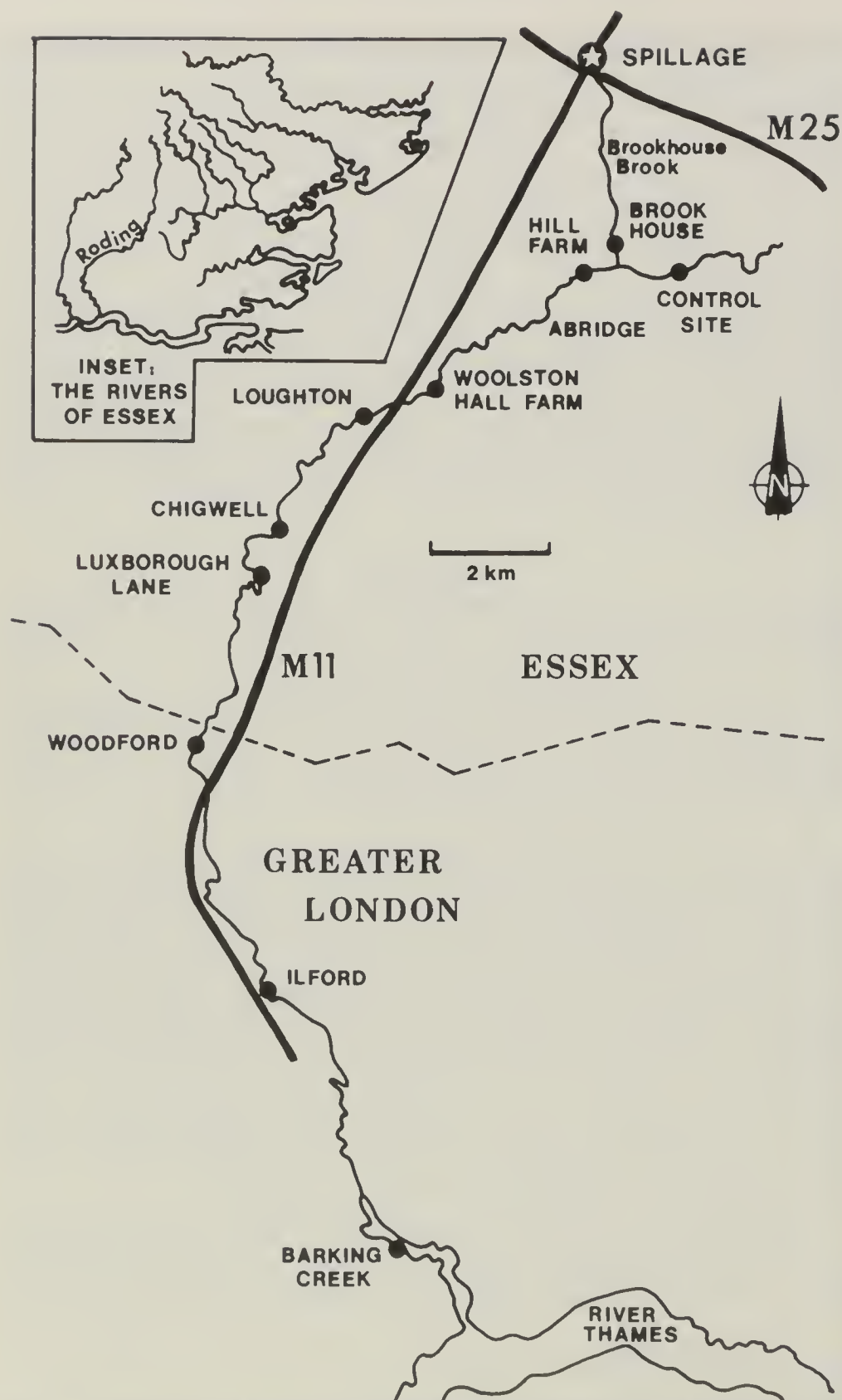


FIG. 1. The location of the chlorpyrifos spillage into Brookhouse Brook and sampling sites along the River Roding.

and Dow Chemical Company (Dow) personnel, the insecticide polluted 20 km of the Roding, reaching the tidal Thames within 48 hours of the spillage. Dursban, developed by The Dow Chemical Company, is extensively used throughout the world to control agricultural and domestic insect pests, but chlorpyrifos (O, O-diethyl O-(3, 5, 6 - trichloro-2-pyridyl) phosphorothioate), is extremely toxic to aquatic arthropods and fish (Table 1). Surveys by T.W.A. personnel soon after the spillage indicated that more than 90% of fish and all aquatic arthropods had been eliminated (Higgins 1986, T.W.A. unpublished data). The unprecedented scale of the pollution prompted T.W.A., Dow and London Wildlife Trust to jointly propose and oversee a project to assess the ecological impact of the spillage and monitor recovery of affected groups of riverine biota, one objective being to determine the optimum time to restock the river with fish. The study, funded by Dow, was carried out at the Polytechnic of Central London (P.C.L.) during November 1985–October 1987.

TABLE 1. The toxicity of chlorpyrifos to selected groups of aquatic biota derived from laboratory and field experiments cited by Marshall and Roberts (1978). Figures represent lethal concentration of chlorpyrifos in water ($\mu\text{g l}^{-1}$), except for mallard and rat (dietary intake as mg per kg bodyweight per day).

	Toxic concentration		Toxic concentration
Bacteria	280,000	Macroinvertebrates: Arthropoda	
Algae: diatoms	250–400*	Corixidae	6–30
Aquatic macrophytes	no effect	Odonata	3–10
Microcrustacea:		<i>Gammarus</i>	<1
Copepoda	<50	<i>Baetis</i>	0.5–1.0
Cladocera	<25	Chironomidae	0.1–6.5
Macroinvertebrates:		Fish: trout	7
Mollusca	>540	Birds: mallard	10–30
Oligochaeta	>1,500	Mammals: rat	3*

*reduced growth

Methods

Chlorpyrifos residues

River water and sediment samples were regularly collected by Dow and T.W.A. personnel for a year after the spillage and analysed for chlorpyrifos. Sampling frequency declined thereafter, but in addition, some fish and aquatic macroinvertebrates were analysed for chlorpyrifos by Huntingdon Research Centre Ltd and P.C.L. respectively. Gas chromatography was used to identify and quantify chlorpyrifos residue in each case (*cf.* Marshall and Roberts 1978 for methods).

Sampling riverine biota

A wide variety of riverine biota was studied but due to extensive pre-spillage data and their importance as prey items for fish, riffle macroinvertebrates were the main focus of attention.

(i) *Macroinvertebrates*

Six riffles (five located in affected reaches and one upstream from Brookhouse Brook which acted as a control site) had previously been sampled by T.W.A. during 1979–84. These sites were re-sampled at *ca.* 10-weekly intervals from 9 April 1985 to 24 April 1987 (Figure 1). Each riffle was kick-sampled for three minutes and material from the disturbed area (*ca.* 3.0 m²) collected in a 25 × 25 cm Freshwater Biological Association (F.B.A.) hand-net with a mesh diameter of 0.96 mm. Animals were live sorted in the laboratory, identified to species where possible and counted. The relative recovery rates of arthropod taxa were qualitatively assessed by comparing the observed time taken to return to

previously inhabited sites with an expected occurrence during 1985-87 deduced from both control site and pre-spillage data. The B.M.W.P. water quality score was also calculated for each sample (Biological Monitoring Working Party 1978).

To assess the impact on taxa which do not normally occur in riffles, (e.g. larval Odonata) other microhabitats (submerged tree roots, fringing vegetation, macrophytes and backwater silt) were sampled with an F.B.A. hand-net at six-monthly intervals after the spillage. Due to the lack of pre-spillage data, samples at two affected sites, Hill Farm (TQ 475977) and Loughton (TQ 438954) were compared with an upstream control (TQ 487976). Foreshore mud and *Phragmites* reedbed in Barking Creek (TQ 443831) were also sampled at these times, primarily because the latter habitat was known to be inhabited by a colony of the rare intertidal gastropod *Pseudamnicola confusa* (Harris 1985).

(ii) Other biota

Although T.W.A. biologists sampled riffle macroinvertebrates during April-September 1985, the November start of the P.C.L. study prevented studies of other biota in the meantime. There was little or no pre-spillage information on aquatic bacteria, diatoms and microinvertebrates so these groups were sampled at two affected sites within 4 km of the spillage point (Brook House, TQ 478982 and Hill Farm) and an upstream control (Figure 1). Rudimentary methodology was adopted in each case. Benthic bacteria were aerobically cultured for six days at 25°C on casein-peptone-starch agar and isolates separated on the basis of colony colour and morphology (cf. Jones 1970). Gravel, silt and macrophyte foliage (*Potamogeton pectinatus*) were collected and microscopically examined for diatoms and ciliate protozoans. Riffle and other microhabitat samples were examined under a binocular microscope for rotifers and microcrustaceans (copepods, ostracods and cladocerans); in addition, these taxa were sampled with a zooplankton net at Abridge (TQ 466969), Chigwell (TQ 427941) and an upstream control in August 1986.

Dragonflies, breeding river-birds and water voles had been studied along the 3.5 km stretch of river between Abridge and Loughton Bridge (TQ 444957) prior to the spillage and each was re-censured in 1986 and 1987 using previous sampling methodologies (Taylor 1982, Raven 1985, 1986c and 1987).

Results

Chlorpyrifos residues

Freshwater reaches of the river initially contaminated with 300-2500 $\mu\text{g l}^{-1}$ chlorpyrifos as an emulsion front of pollution passed downstream. Within three weeks of the spillage residue levels in river water had declined below 10 $\mu\text{g l}^{-1}$ and by week 11 were less than 1.0 $\mu\text{g l}^{-1}$. A slightly higher concentration (2.3 $\mu\text{g l}^{-1}$) was recorded at Abridge 59 weeks after the spillage but chlorpyrifos was not detected in river water after week 64 (Figure 2).

Chlorpyrifos is strongly adsorbed onto organic surfaces (Marshall and Roberts 1978). River sediment near the spillage point was heavily contaminated, with 818 mg kg^{-1} and 21 mg kg^{-1} chlorpyrifos recorded in Brookhouse Brook and the Roding at Abridge respectively. Chlorpyrifos residue persisted longer in sediment than river water (Figure 2) and isolated patches of contamination (up to 35 $\mu\text{g kg}^{-1}$) were present in the Roding 120 weeks after the spillage.

Estuarine reaches of the river were also contaminated. A maximum concentration of 28 $\mu\text{g l}^{-1}$ was recorded in tidal water, while small levels of chlorpyrifos residue (4-15 $\mu\text{g kg}^{-1}$) persisted in foreshore mud in Barking Creek for 100 weeks after the spillage.

Chlorpyrifos residue was detected in five macroinvertebrate taxa 67 and 68 weeks after the spillage (up to 132 $\mu\text{g kg}^{-1}$ in *Asellus aquaticus*) but none occurred in freshwater plant or invertebrate samples by week 87. However, more than two

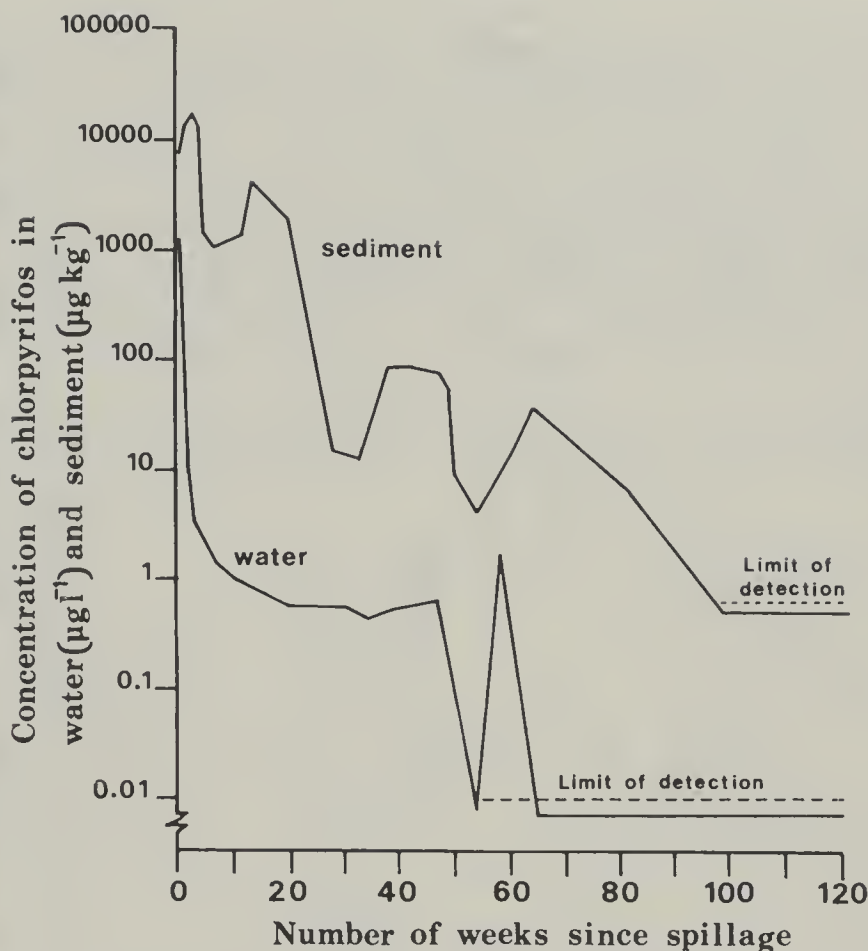


FIG. 2. The decline of chlorpyrifos residue in river water and sediment at Abridge.

years after the spillage mud-dwelling oligochaetes and flounder *Platichthys flesus* sampled from Barking Creek contained up to $5 \mu\text{g kg}^{-1}$ and $16 \mu\text{g kg}^{-1}$ chlorpyrifos respectively.

Riverine biota

(ii) Macroinvertebrates

Aquatic arthropods were eliminated by the spillage. Consequently, the impact on the riffle macroinvertebrate community was greater in upper affected reaches which previously supported a more diverse and abundant arthropod fauna than the poorer water quality urban sites. Molluscs, including the colony of *Pseudamnicola confusa* in Barking Creek, and annelids (oligochaetes and leeches) survived. The pattern of changes in the number of invertebrate families and the B.B.M.W.P. score at each riffle site during 1979-87 were similar, both indicating the severity of the chlorpyrifos spillage and subsequent recovery of the fauna and water quality (Figure 3).

Experimental laboratory tests by T.W.A. biologists indicated that river water remained acutely toxic to freshwater shrimps *Gammarus pulex* for 10 weeks after the spillage. However, highly susceptible chironomid midge larvae had started to recolonize riffles in upper affected reaches within 13 weeks and most other eliminated taxa had returned by week 79 (October 1986). Indeed, out of 21 eliminated taxa, only the caddis-fly larva *Tinodes waeneri* had failed to recolonize

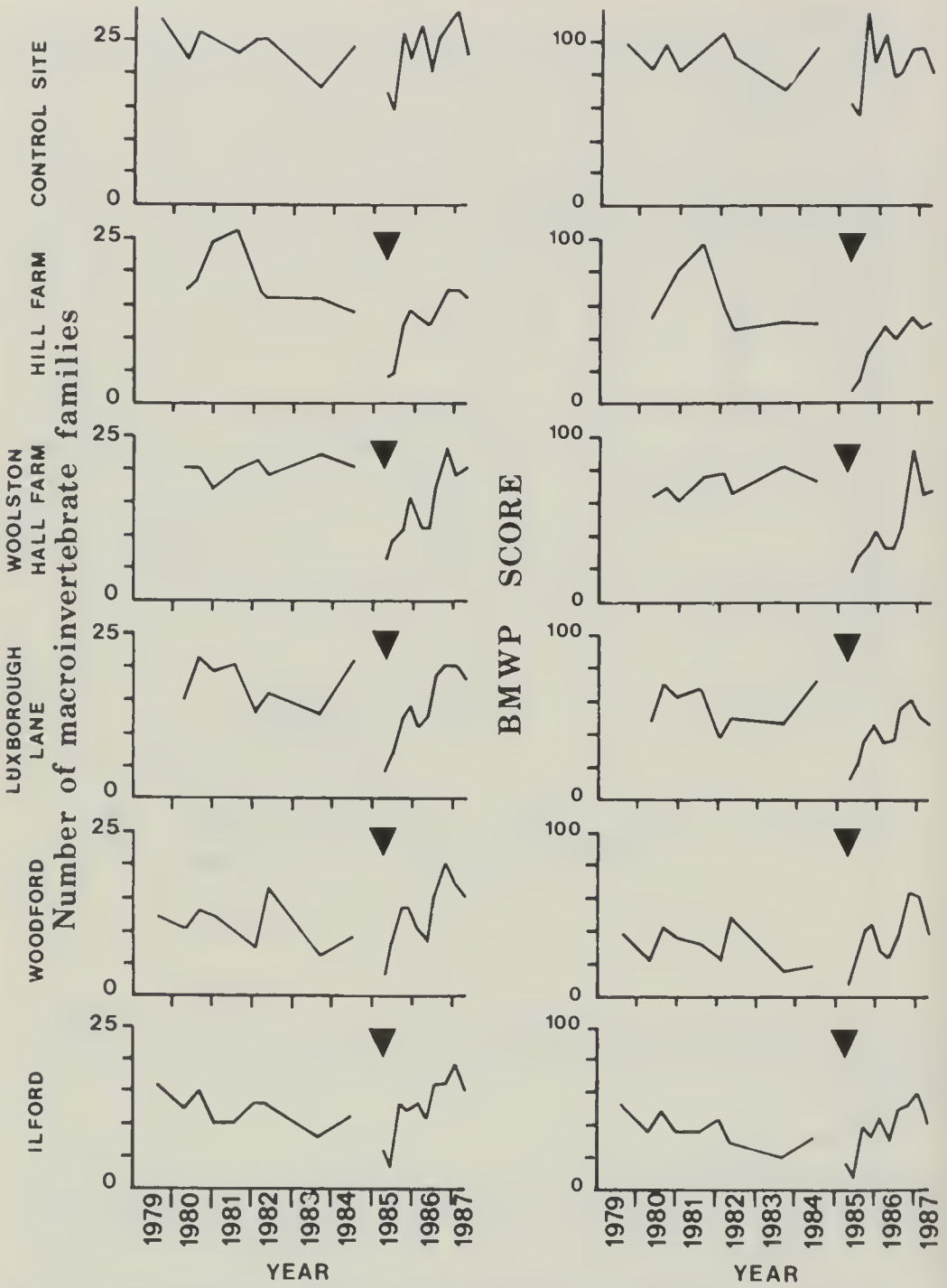


FIG. 3. Changes in the number of macroinvertebrate families and the B.M.W.P. score at five riffle sites affected by the chlorpyrifos spillage (▼), compared with an upstream control.

affected reaches within 108 weeks of the spillage. The relative recovery rates of eliminated taxa varied considerably and there was no evidence for successional recolonization by different groups of arthropods (Table 2). Most water-beetle species (Coleoptera) and water-bugs (Hemiptera) recolonized submerged tree roots and fringing vegetation in affected reaches relatively quickly, but larval dragonflies were slow to return. Since the order in which eliminated taxa returned was not associated with increasing susceptibility to chlorpyrifos (Tables 1 and 2), immigration from unaffected reaches, and particularly the occurrence and abundance of individual species in downstream drift, probably determined the pattern of recovery. Unfortunately, lack of time prevented drift-net sampling to test this hypothesis, but a survey of tributary streams entering affected reaches during 1986 (Boreham, unpublished data) suggested that the Roding upstream from Brookhouse Brook was the main source for arthropod recolonization.

TABLE 2. The impact of chlorpyrifos on the macroinvertebrate fauna at five riffle sites along the Roding: survivors and the relative recolonization rates of eliminated taxa. Only taxa recorded at least twice at one or more riffle sites during 1979-84 included. 'R' = recolonization index (0-100).

Surviving Taxa	Eliminated arthropod taxa			
Nematoda	Rapid recolonizers	R	<i>Chironomus riparius</i>	53
Oligochaeta	<i>Asellus aquaticus</i>	95	<i>Gammarus zaddachi</i>	50
<i>Erpobdella octoculata</i>	Chironomidae	95	<i>Athripsodes</i> spp.	50
<i>Glossiphonia complanata</i>	Lebertiidae	73	Slow recolonizers	
<i>Valvata piscinalis</i>	<i>Haliplus</i> spp.	70	<i>Caenis moesta</i>	45
<i>Potamopyrgus jenkinsi</i>			<i>Baetis rhodani</i>	42
<i>Bithymia tentaculata</i>	Moderate recolonizers		<i>Oulimnius tuberculatus</i>	40
<i>Lymnaea peregra</i>	<i>Elmis aenea</i>	67	<i>Sialis lutaria</i>	38
<i>Bathymphalus contortus</i>	<i>Hydropsyche angustipennis</i>	56	<i>Simulium</i> spp.	33
<i>Gyraulus albus</i>	<i>Gammarus pulex</i>	55	<i>Tipula</i> spp.	31
<i>Ancyclus fluviatilis</i>	Ceratopogonidae	55	<i>Potamonectes elegans</i>	0
<i>Sphaerium corneum</i>	Hygrobatidae	55	<i>Tinodes waeneri</i>	0

Surprisingly, few surviving mollusc and annelid taxa increased in abundance during 1985 despite negligible fish predation and much reduced competition from aquatic arthropods. Furthermore, most recolonizing taxa did not recover to pre-spillage abundance levels until the summer or autumn of 1986 when juvenile recruitment was re-established. However, water mites (Hydracarina), the caddis-fly larva *Hydropsyche angustipennis* and the riffle beetle *Oulimnius tuberculatus* were notably less abundant in some previously inhabited sites two years after the spillage.

(ii) Other biota

There was little difference in the benthic bacteria, diatom, ciliate protozoan and rotifer samples from affected and unaffected reaches of the Roding during February 1986 (Table 3). The greater abundance of bacteria and ciliates in Brookhouse Brook, together with an impoverished diatom flora probably reflected continued poor water quality caused by effluent discharge from Fiddler's Hamlet Sewage Treatment Works, Epping. Copepods and ostracods

TABLE 3. A summary of bacteria, diatoms, ciliate protozoans and rotifers sampled at Brook House and Hill Farm 46 weeks after the chlorpyrifos spillage, compared with an upstream control site.

	R. Roding Upstream control	Brookhouse Brook Brook House	R. Roding Hill Farm
Mean number of bacteria ml ⁻¹	1.6 × 10 ⁶	4.1 × 10 ⁷	2.1 × 10 ⁷
Number of bacterial types	21	20	18
Number of diatom taxa	9	3	7
Number of ciliate taxa	11	12	10
Number of rotifer taxa	2	2	1

were first recorded in affected reaches 36 and 67 weeks after the spillage respectively. In August 1986 (week 71) copepods, ostracods and cladocerans were abundant in the zooplankton net samples at Abridge and Chigwell.

All eleven dragonfly species recorded during 1980-82 occurred along affected reaches of the river in 1986 and near Abridge the blue-tailed damselfly *Ischnura elegans* was notably more abundant than previously (Table 4). In contrast, the banded demoiselle *Calopteryx splendens* and brown hawket *Aeshna grandis* were relatively scarce in 1986. However, by 1987 most species were as numerous or more abundant than in 1981-82.

contrast, little grebe and kingfisher were absent from this stretch, presumably in response to the lack of fish. Furthermore only a single pair of kingfishers nested

TABLE 4. The maximum number of the six most common dragonflies along 3.5 km of the Roding near Abridge before and after the chlорpyrifos spillage.

Species	Pre-spillage	One and two years post-spillage	
	1981-82	1986	1987
<i>Platynemmis pennipes</i>	25	24	30
<i>Ischnura elegans</i>	40	159	233
<i>Calopteryx splendens</i>	87	20	77
<i>Aeshna grandis</i>	35	19	27
<i>Aeshna mixta</i>	49	7	15
<i>Sympetrum striolatum</i>	28	46	51

At least one kingfisher was found dead along the river immediately after the spillage. In addition, there were reports of drowsiness and wing droop in heron and mallard, both classic symptoms of chlорpyrifos poisoning (cf. Marshall and Roberts 1978). In 1986, seven out of nine river-bird species which previously bred near Abridge were present in similar or greater numbers than 1982 (Table 5). In contrast, little grebe and kingfisher were absent from this stretch, presumably in response to the lack of fish. Furthermore only a single pair of kingfishers nested along a 5 km stretch of river immediately downstream, previously occupied by four pairs (C. Johnson, personal communication). Both little grebe and kingfisher returned to breed near Abridge in 1987 shortly after the fishery was fully restocked.

TABLE 5. The number of breeding river-bird territories along 3.5 km of the Roding near Abridge before and after the chlорpyrifos spillage.

Species	Pre-spillage	One and two years post-spillage	
	1982	1986	1987
Little Grebe <i>Tachybaptus ruficollis</i>	2	—	1
Mallard <i>Anas platyrhynchos</i>	6	11	11
Moorhen <i>Gallinula chloropus</i>	18	27	27
Kingfisher <i>Alcedo atthis</i>	1	—	1
Reed Warbler <i>Acrocephalus scirpaceus</i>	11	12	16
Sedge Warbler <i>Acrocephalus schoenobaenus</i>	3	2	3
Pied Wagtail <i>Motacilla alba</i>	2	1	2
Yellow Wagtail <i>Motacilla flava</i>	4	5	4
Reed Bunting <i>Emberiza schoenichus</i>	8	8	10
Total number of breeding species	9	7	9
Total number of territories	55	66	75

A small number of water voles were reportedly found dead in the river soon after the spillage. However, the extent of grazed bankside vegetation, abundance of fresh droppings, distribution of occupied burrows and frequency of sightings suggested that water voles were equally as abundant and active near Abridge in 1986-87 as they had been in 1980-82.

Discussion

Since only macroinvertebrates (and fish) were monitored during the 1985 summer it is necessary to speculate about the short-term impact of the chlorpyrifos spillage on other groups of biota by referring to previously published ecotoxicological data. However, it should be emphasized that these toxicity data were largely derived from static, warm-water experimental conditions in the southern U.S.A., *i.e.* aquatic ecosystems differing considerably from the Roding.

Aquatic bacteria

Extremely high concentrations of chlorpyrifos (280 mg l^{-1}) are required to produce significant bacterial mortality (Steelman *et al.* 1967). Consequently, any adverse effects of chlorpyrifos were probably confined to Brookhouse Brook immediately after the spillage when peak residue levels of 14 mg l^{-1} and 818 mg kg^{-1} were recorded in water and sediment respectively.

Freshwater algae and macrophytes

Reduced growth of some algal taxa exposed to $250\text{--}400 \text{ }\mu\text{g l}^{-1}$ chlorpyrifos has been reported (Nelson *et al.* 1976). It is unlikely, therefore that the spillage had any significant effect on algal populations in the Roding for more than 3–4 days, by which time chlorpyrifos residue in river water had declined to below $100 \text{ }\mu\text{g l}^{-1}$. Indeed, the filamentous green alga *Cladophora* was particularly abundant during the 1985 summer, possibly a result of reduced grazing pressure caused by the elimination of herbivorous arthropod taxa (*cf.* Hurlbert *et al.* 1972). There is no unequivocal evidence that chlorpyrifos is phytotoxic to aquatic macrophytes even though it is strongly adsorbed onto plant surfaces (Marshall and Roberts 1978, Smith *et al.* 1972). No adverse impact on river channel vegetation was noted by T.W.A. biologists after the spillage.

Aquatic microinvertebrates

There are no chlorpyrifos toxicity data for ciliate protozoans, but rotifers are relatively tolerant to the insecticide (Hurlbert *et al.* 1972). It is unlikely that these groups were significantly affected by the spillage. In contrast, microcrustaceans and cladocerans in particular are highly susceptible to chlorpyrifos (Ruber and Baskar 1968) and it is probable that they were eliminated throughout affected reaches. However, recolonization could theoretically have begun within 11 weeks when chlorpyrifos residue in river water had declined below $1 \text{ }\mu\text{g l}^{-1}$ (*cf.* Table 1).

Dragonflies

Larval dragonflies were doubtless eliminated by the spillage because $10 \text{ }\mu\text{g l}^{-1}$ chlorpyrifos is lethal to this group of aquatic insects (Whitney 1965). Furthermore, larvae were relatively slow to recolonize affected reaches (Raven 1987). Presumably, adult dragonflies which emerged from unaffected reaches attempted to breed along affected reaches in 1985, but it is unclear if eggs laid in the water that summer developed successfully. It is particularly encouraging that the white-legged damselfly *Platynemis pennipes*, which is considered to be prone to river pollution (Corbet *et al.* 1960) was equally abundant in 1986 and 1987 as before the spillage (Table 4).

River-birds

Chlorpyrifos is moderately toxic to birds such as mallard (Kenaga 1974) and initial concentrations in river water could have produced the wing droop and drowsiness in a heron and ducks reported immediately after the spillage. Theoretically, ingestion of highly contaminated aquatic plant and animal food items could have been toxicologically significant for a further few weeks, with chicks hatched early in the 1985 breeding season particularly at risk. It is more likely, however, that piscivorous birds (*e.g.* little grebe and kingfisher) were

affected more by the lack of food than the toxicity of prey items and their absence from the river near Abridge in 1986 was therefore a secondary, indirect effect of the spillage (Table 5).

Water voles

Chlorpyrifos is moderately toxic to rodents (Marshall and Roberts 1978). High initial residue levels of chlorpyrifos adsorbed onto vegetation immersed during passage of the emulsion front downstream could theoretically have been lethal to water voles grazing on waterside plants. However, a combination of the rapid decline in residue levels and higher water levels following heavy rainfall (which would have forced grazing animals to feed on uncontaminated vegetation further up the bank), probably limited any significant toxicological effects to the first two or three days after the spillage.

Conclusions

Fortunately there were no other major pollution incidents along the Roding during the study period. Consequently, despite a number of constraining factors, this unique study was able to directly and indirectly assess the impact of the chlorpyrifos spillage, primarily because of an unusually extensive amount of biological data collected prior to April 1985. The impact of the spillage was largely predictable as the rapid decline of chlorpyrifos levels in river water, the longer persistence of residue in sediment, the elimination of aquatic arthropods and fish, and the negligible effects on aquatic bacteria, algae, macrophytes, annelids and molluscs broadly reflected results from previous ecotoxicological studies based on experimentally-treated warm-water ponds (Marshall and Roberts 1978). Recolonization of affected reaches by the most susceptible aquatic arthropod taxa (Chironomidae) soon after the concentration of chlorpyrifos in river water had declined below $1 \mu\text{g l}^{-1}$ is also in broad agreement with previous experimental studies (Hurlbert *et al.* 1972). The importance of downstream drift in the recovery of macroinvertebrate taxa following pollution has also been cited widely (*e.g.* Hynes 1960).

Following a successful experimental trial, and the knowledge that macroinvertebrate food items were recovering well, T.W.A. fully restocked the river with fish during November 1986-March 1987. The return of breeding kingfisher and little grebe near Abridge soon afterwards meant that the Roding ecosystem, with a few minor exceptions, was restored to its pre-spillage status in little more than two years.

This study has emphasised not only the extreme vulnerability of certain groups of riverine biota to gross pollution by chlorpyrifos, but also the ability of the Roding ecosystem to recover quickly after the water had become non-toxic. It has also highlighted the need for comprehensive biological data-bases for rivers, more relevant ecotoxicological data for insecticides and the advantages derived from cooperation between representatives from the water industry, chemical manufacturers, academic institutions and nature conservation groups. However, a number of important issues remain unresolved, including (i) the movement and redistribution of contaminated sediment in freshwater and tidal reaches, (ii) the dermal and dietary toxicity of contaminated sediment to benthic animals and their predators, (iii) the longer-term sublethal effects of low concentrations of chlorpyrifos on aquatic biota, and (iv) the longer-term occurrence of residue in the tidal ecosystem of Barking Creek.

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Book Review

Egg. Nature's Miracle of Packaging. By Robert Burton. Collins, London. 1987. 158pp. £9.95. ISBN 0-00-219437-6.

This book deals with not only birds' eggs as would be expected, but also the whole spectrum of egg-laying species including amphibians, reptiles, fish, insects, gastropods and many other invertebrates.

The author observes that the egg is surely one of Nature's most remarkable and versatile inventions, and then proceeds to prove this ably supported by the most beautiful and exciting colour photographs by Jane Burton and Kim Taylor.

Chapter 1 deals with the evolution of the egg, and relates this to Darwin's theory of evolution by natural selection, which is a heartening thing these days when it is the vogue to denigrate this theory. Seeds are also touched upon because they are in reality the eggs of plants.

Chapters follow on dealing with eggs for all lifestyles, fertilization, and launching the eggs. All are dealt with in a fascinating, factual and informative manner. Here such things as the ways of a female ichneumon fly are expounded to the uninitiated.

Nests, not only of birds but also of bees, wasps and sticklebacks, to name but a few, are shown to be secure homes for their owner's eggs. This book also shows that there are exceptions to this.

Chapter 6 deals with the number of eggs laid and is followed by chapters on development, hatching and parental care.

The final chapter is entitled 'Beyond the Egg', and discusses ovoviviparity. This chapter also shows that there is really no great difference between the essential processes of reproduction, of transforming a fertilized egg into an animal in relation to a bird or a mammal despite initial appearances.

This book is an absorbing and readable production which should be read by all nature lovers.

R. V. GOULDING

A Preliminary List of Essex Spiders

by P. R. HARVEY*

Introduction

In his recent article 'A New List of Spiders Found in London' Milner (1987) has followed previous arachnological practice in using the boundary of the old County of London. However as a substantial part of south-west Essex lies within the recording area of the London Natural History Society a preliminary list of Essex spiders may be of special interest to L.N.H.S. members as well as being of interest to British arachnologists.

South-west Essex

The many sites of natural history significance include areas like Epping Forest, still a locality of importance today despite the many adverse pressures that exist on green spaces close to the Capital. In 1985 John Bratton, then with the Epping Forest Conservation Centre, carried out a lot of recording in the Forest and many spiders were found.

Wood-pasture still exists at Hainault Forest and Thorndon Park and there are many scattered fragments of ancient woodland such as the Running Water, Warwick and White Post Woods of Belthus Park, Ockendon. Despite their size these are places of considerable entomological and arachnological interest. Other habitats that have suffered a drastic national decline survive in the area, for example the ancient flood meadows in the Roding Valley and the grazing marsh at Rainham Marshes. The Thames still has some tidal habitat but very little remains along the lower reaches of the rivers that feed into it. The Ingrebourne has an important area of freshwater marsh near Rainham and the upper reaches of the Lea Valley have habitats of interest although little work on spiders has been carried out there. The complex of old quarries in the Grays and Purfleet region contains the best chalk habitat in Essex and there are numerous nationally important invertebrate records for the quarries.

Unfortunately the vicinity of London does put many pressures on these sites and the completion of the M25 has greatly increased the demand for commuter housing and industrial developments. Two examples at present are at Grays and Purfleet where the quarries will largely be lost to massive housing development and at Rainham where the proposal to re-route the A13 trunk road through the Rainham Marshes S.S.S.I. with its associated opportunity for industrial development is the alternative favoured by the Minister of Transport.

Spider Recording

Our knowledge of the national and local distribution of spiders is at present rather poor and there is much work to be done. Information is also necessary if sites under threat are to be defended, but all too often this information has to be collected at the last minute. The introduction of a National Spider Recording Scheme last year by the British Arachnological Society and Biological Records Centre provides an opportunity to put spiders on the map (literally!) and with the availability now of several excellent books for their identification hopefully more people will be encouraged to participate. Recorders can register and obtain recording cards free of charge by writing to the B.R.C. at Monk's Wood.

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Preliminary List of Essex Spiders

The list covers the whole of Essex but is not at present an accurate guide to spider distribution in the county. Reference has been made to records compiled by the Flatford Mill Spider Group between 1958-1961 and by the British Arachnological Society courses held there since, to county records included in Volume 3 of *British Spiders* by Locket, Millidge and Merrett and additions to these published in the B.A.S. bulletin, to records held by the Passmore Edwards Museum, to the records held by the Essex Field Club and to the records made in recent years by the Essex Spider Group, especially by Kate Rowland the previous county recorder, John Hancock, Ken Hill, Ray Ruffell and Peter Winter. The list comprises 381 species out of a total of over 600 British species. Those species reported for the first time are denoted by an *.

The classification follows Locket, Millidge and Merrett (1974).

Family ATYPIDAE

Atypus affinis, only one recent record (Grays, 1985-7).

Family AMAUROBIIDAE

Amaurobius fenestralis, probably widespread.

A. similis, probably widespread.

A. ferox, few records but probably widespread.

Family DICTYNIDAE

Dictyna arundinacea, many records, common.

D. pusilla, recorded for Essex in Vol. 3, L.,M.&M.

D. uncinata, probably widespread.

D. latens, seems to be widespread.

Nigma puella, one recent record (Tiptree 1984/5).

N. walckenaeri, few records in S.W. Essex.

Lathys humilis, scattered records.

**Argenna subnigra*, few scattered records.

A. patula, only four recent records.

Family OONOPIDAE

Oonops pulcher, one recent record (Tiptree, 1984/5).

O. domesticus, one record (Colchester, 1982 & 1985).

Family SCYTODIDAE

Scytodes thoracica, few records.

Family DYSDERIDAE

Dysdera erythrina, few records.

D. crocata, probably widespread.

Harpactea hombergi, probably widespread.

Family SEGESTRIIDAE

Segestria senoculata, few records but probably widespread.

Family PHOLCIDAE

Pholcus phalangioides, few records.

Family ZODARIIDAE

**Zodariion italicum*, one site (Grays), but may occur elsewhere in Essex – it was found on the Isle of Grain, Kent in 1988.

Family GNAPHOSIDAE

Drassodes lapidosus, probably widespread.

D. cupreus, one old record and four recent records.

D. pubescens, two records (Tiptree, 1985 and Birch Spring, Blackmore, 1988).

Haplodrassus signifer, few records, but probably widespread.

H. silvestris, two recent records (Epping Forest, 1985 and Donyland Wood, 1987)

H. minor, one old record for Colne Point and 1988 records for Foulness and the Dengie peninsula.

Scotophaeus blackwalli, few records.

Zelotes pedestris, recorded for Essex in Vol. 3, L.,M.&M.

Z. luteianus, two old records for Colne Point and Walton Naze and 1988 records for Crabknowe Spit and Pitsea Marshes.

- **Z. pusillus*, one record (Martin's Farm, 1985).
- Z. rusticus*, recorded for Essex in Vol. 3, L.,M.&M.
- Z. electus*, two old records for Colne Point and Crabknowe Spit and a 1988 record for Shobury.
- Z. latreillei*, probably widespread.
- Z. apricorum*, scattered records.
- Z. subterraneus*, recorded from Colne Point, 1961, 1977-8, Dengie peninsula, 1987 & 1988 and Foulness, 1988).
- Z. serotinus*, old record for Colne Point.
- Micaria pulicaria*, few records but probably common.

Family CLUBIONIDAE

Subfamily Clubioninae

- Clubiona corticalis*, few records, but probably widespread.
- C. reclusa*, probably widespread.
- C. stagnatilis*, scattered records.
- C. pallidula*, four recent records, probably more common.
- C. phragmitis*, probably widespread.
- C. terrestris*, scattered records, probably widespread.
- C. neglecta*, few records.
- C. lutescens*, scattered records, probably widespread.
- C. compta*, scattered records, probably widespread.
- C. brevipes*, few scattered records, but probably widespread.
- **C. juvenis*, one record (Stanford Warren, 1987).
- C. diversa*, only three recent records, but probably more common.
- C. subtilis*, coastal records.
- Cheiracanthium erraticum*, few scattered records.
- C. virescens*, one old record (Colne Point), two recent records (Grays, 1985-7 and Eastbrookend, Dagenham, 1984).

Subfamily Liocraninae

- Agroeca brunnea*, few scattered records, but probably widespread.
- A. proxima*, few scattered records, but probably widespread.
- A. inopina*, few scattered records, but probably widespread.
- **A. striata*, two records (Old Hall Marsh, 1985 and Woodham Fen, 1988).
- **Scotina celans*, two records (Epping Forest, 1985 and Tiptree Heath, 1985).
- Phrurolithus festivus*, probably common.
- **P. minimus*, 1988 record for Donyland Wood.

Family ZORIDAE

- Zora spinimana*, scattered records, probably common.

Family ANYPHAENIDAE

- Anyphaena accentuata*, scattered records, widespread.

Family THOMISIDAE

Subfamily Misumeninae

- Thomisus onustus*, recorded for Essex in Vol. 3, L.,M.&M.
- Diaea dorsata*, four recent records.
- Misumena vatia*, scattered records, probably widespread.
- Xysticus cristatus*, many records, common.
- X. audax*, few records.
- X. kocki*, few scattered records.
- **X. erraticus*, four records (Epping Forest area, 1985, Tiptree, 1985 and Pitsea, 1988).
- X. lanio*, two recent records (Great Horkesley, 1981 and Chalkney Wood, 1983).
- Xysticus ulmi*, recorded recently from a number of woodland and marsh localities.
- **X. bifasciatus*, one record (Tiptree Heath, 1985).
- X. luctuosus*, recorded for Essex in Vol. 3, L.,M.&M.
- X. acerbus*, specimen from Epping Forest in the O.P.-Cambridge/A. R. Jackson coll. (ref. Vol. 3, L.,M.&M.).
- **Oxyptila sanctuaria*, very few records.
- O. praticola*, two recent records (Grays, 1986 and Warwick Wood, Aveley, 1987).
- O. trux*, two recent records (Tiptree Heath, 1984/5 and Donyland Wood, 1988).
- O. simplex*, scattered records, probably widespread.
- **O. atomaria*, recorded twice at Tiptree Heath, 1984/5, and 1987.
- O. brevipes*, three recent records (High Woods, Colchester, 1985 Grays, 1986-7 and Pitsea, 1988).

Subfamily Philodrominae

Philodromus dispar, scattered records, probably common.

P. aureolus, scattered records.

**P. praedatus*, in some numbers (Thorndon Park, 1988).

P. cespitum, widespread, probably common.

P. fallax, one old record from Colne Point and recorded from Crabknowe Spit, 1988.

P. histrio, recorded from Colne Point as recently as 1984 and Bradwell, 1987 in saltmarsh habitat).

P. rufus, six records, all since 1977.

Thanatus striatus, coastal records.

Tibellus maritimus, one recent record (Shoeburyness, 1984).

T. oblongus, scattered records, probably common.

Family SALTICIDAE

Salicus scenicus, scattered records, probably common.

S. cingulatus, Essex included in Vol. 3, L.,M.&M.

Heliophanus cupreus, five records, since 1979, but probably more common.

H. flavipes, few records but probably widespread.

H. auratus, one old record (Colne Point) and two recent records (both Blackwater Estuary, 1987).

Marpissa muscosa, one recent record (Birch near Colchester, 1984).

Bianor aurocinctus, two old records (Colne Point and S. Essex), one recent record (Grays, 1985-7).

Ballus depressus, few records .

Neon reticulatus, three recent records but probably more common.

Euophrys frontalis, scattered records, probably common.

E. erratica, recorded for Essex in Vol. 3, L.,M.&M.

E. aequipes, few records.

**E. lanigera*, two records (Manor Park, 1984/5 and Grays, 1985-7) but probably more widespread.

E. browni, old records for Colne Point and Walton Naze, recent records for Colne Point, Dengie peninsula and Foulness.

Sitticus pubescens, few records, probably more widespread.

S. caricis, recorded for Essex in Vol. 3, L.,M.&M.

Sitticus rupicola, recorded at Colne Point, and the Dengie peninsula and Mersea, 1987 & 1988.

Anulus saltator, Colne Point only (1958-61 and 1984).

Evarcha falcata, few records, probably more common.

E. arcuata, one old record (Elmstead).

Myrmarchae formicaria, record shown in Vol. 3, L.,M.&M. (? Hadleigh Downs area).

Family LYCOSIDAE

Pardosa agrestis incl. *P. purbeckensis* (F.O.P.-Cambridge) Coastal records, only one inland record.

P. monticola, very few records.

P. palustris, scattered records, probably widespread.

P. pullata, many scattered records, probably common.

P. pratigaga, many scattered records, probably common.

P. amentata, scattered records, probably widespread.

P. nigriceps, many scattered records, probably common.

P. lugubris, scattered records, probably common.

P. hortensis, few records.

P. proxima, recorded for Essex (*Bull. Br. arachnol. Soc.* 5: 333).

**Xerolycosa nemoralis*, recorded from Birch Spring, Blackmore, 1988).

**Xerolycosa miniata*, one record (Colne Point, 1984).

Alopecosa pulverulenta, scattered records, probably common.

A. cuneata, one old record from Colne Point.

A. accentuata, old record from Crabknowe Spit.

Trochosa ruricola, scattered records, probably common.

T. terricola, scattered records, probably common.

T. spinipalpis, old record for Colne Point.

Arctosa fulvolineata, old records for Colne Point and Wrabness.

A. perita, few records, probably more widespread.

Arctosa leopardus, one old record for Colne Point and 1988 record for Stone Ness, Thurrock.

Pirata piraticus, scattered records, probably widespread.

P. hygrophilus, very few records but probably common.

**P. uliginosus*, records from Epping Forest, 1985 and Hatfield Forest, 1988.

**P. latitans*, four records all since 1985.

Family PISAURIDAE

Pisaura mirabilis, many records, common.

Family ARGYRONETIDAE

Argyroneta aquatica, three recent records, since 1980.

Family AGELENIDAE

Agelena labyrinthica, records mainly in the east of the county.

Textrix denticulata, recorded for Essex in Vol. 3, L.,M.&M.

Tegenaria duellica, rather few scattered records.

T. saeva, old record for Colne Point.

T. parietina, few scattered records.

**T. agrestis*, scattered records.

T. domestica, four recent records only, under-recorded?!

T. silvestris, few scattered records.

**Coelotes atropos*, two records (Tiptree, 1985 and Stour Wood, 1987).

Cicurina cicur, few records in S.W. Essex.

Family HAHNIIDAE

Antistea elegans, scattered records.

Hahnina montana, three recent records, probably more common.

Hahnina nava, few scattered records.

H. helveola, only six recent records, probably more common.

**H. pusilla*, one record (Stour Wood, 1987).

Family MIMETIDAE

Ero cambridgei, scattered records.

E. furcata, scattered records.

Family THERIDIIDAE

Episinus angulatus, few scattered records, probably widespread.

E. maculipes, 1929 Tiptree record (1♀), never refound.

**Euryopsis flavomaculata*, one record (Donyland Wood, 1987).

Dipoena inornata, one recent record (Grays, 1986-7).

Crustulina guttata, very few records.

Steatoda bipunctata, few scattered records but probably widespread.

**S. grossa*, one record (Manor Park, 1983-4).

Anelosimus vittatus, scattered records, probably common.

A. aulicus, recorded for Essex in Vol. 3, L.,M.&M.

Achaearanea lunata, few scattered records, probably more common.

A. tepidariorum, recorded for Essex in Vol. 3, L.,M.&M.

**A. tepidariorum simulans*, four records, all since 1985.

Theridion sisyphium, scattered records, probably widespread.

T. impressum, two recent records (? Friday Woods, Colchester, 1977 and Epping Forest, 1985).

T. pictum, recorded for Essex in Vol. 3, L.,M.&M.

T. simile, three recent records.

T. varians, scattered records, probably common.

T. familiare, recorded for Essex in Vol. 3, L.,M.&M.

T. melanurum, scattered records, probably widespread.

T. mystaceum, few records, but probably widespread.

**T. blackwalli*, one record (Colchester, 1986).

T. tinctum, scattered records, probably common.

**T. instabile*, five records, 1983-1988.

T. bimaculatum, scattered records, probably common.

T. pallens, widespread records, probably common.

Enoplognatha ovata, many records, probably common.

**E. latimana*, scattered records.

E. thoracica, few scattered records.

E. crucifera, few records, but probably widespread in saltmarsh.

E. oelandica, old doubtful record (see Bratton 1987).

Robertus lividus, few records, but probably widespread.

R. arundineti, two recent records (St Osyth, 1985 and Grays, 1986).

R. neglectus, one recent record (Watts Wood, Thurrock, 1987).
Pholcomma gibbum, very few records, but probably widespread.

Family NESTICIDAE

**Nesticus cellulanus*, one record (Thorndon Park, 1985).

Family TETRAGNATHIDAE

Tetragnatha extensa, probably widespread.
T. pinicola, rather few records.
T. montana, many scattered records.
T. obtusa, few records, but probably widespread.
T. nigrita, few scattered records.
Pachygnatha clercki, many scattered records.
P. degeeri, many scattered records, common.
P. listeri, only four recent records, but probably more widespread.
Meta segmentata, rather few records but probably common.
M. mengei, many scattered records.
M. merianae, few scattered records.
 **M. menardi*, one record (Grays, 1988).
M. bourneti, one record (near Harwich Docks, 1975).

Family ARANEIDAE

Gibbaranea gibbosa, few scattered records.
Araneus diadematus, many scattered records.
A. quadratus, scattered records.
A. marmoreus pyramidatus, recorded for Essex in Vol. 3, L.,M.&M.
Atea sturmi, very few records.
A. triguttata, few records.
Larinioides cornutus, many scattered records.
L. scopetarius, one recent record (Dagenham, 1984).
L. patagiatus, four recent records.
Nuctenea umbratica, scattered records, probably common.
Agelenatea redii, rather few records, but probably widespread.
Neoscona adianta, scattered records, sometimes abundant.
Araniella cucurbitina, scattered records, probably widespread.
 **A. opistographa*, few scattered records but probably widespread.
 **A. inconspicua*, one record (Thorndon Park, 1987).
Zilla diodia, scattered records.
Hypsosinga pygmaea, scattered records.
 **Singa hamata*, one record (Woodham Fen, 1987).
 **Cercidia prominens*, Hatfield Forest and Thorndon Park, both 1988 records.
Zygiella x-notata, few records, but probably common.
Z. atrica, few scattered records.
Mangora acalypha, recorded only from Tiptree Heath, 1983, 1987 and Danbury Common, 1987.
Cyclosa conica, few records, probably more common.

Family LINYPHIIDAE

**Ceratinella brevipes*, three records, 1977-1985.
C. brevis, four recent records.
 **C. scabrosa*, two records (Warwick Wood, Aveley and Watts Wood, Thurrock, both 1987).
 **Walckenaeria dysderoides*, records only for Old Hall Marshes, 1985 and Watts Wood, Thurrock, 1987).
W. nudipalpis, few records but probably widespread.
 **W. obtusa*, two records (Tiptree Heath, 1985 and Hockley Woods, 1986).
 **W. vigilax*, few records.
W. antica, scattered records, probably common.
W. cucullata, two recent records (Crabknowe Spit, 1984 and Writtle Woods, 1987).
W. nodosa, one recent record (Tiptree, 1984/5).
 **W. cuspidata*, four records, 1983-7.
 **W. furcillata*, one record (Tiptree Heath, 1985).
 **W. atrotibialis*, few scattered records.
W. capito, one old record for Crabknowe Spit.
W. unicornis, scattered records, probably common.
W. monoceros, recorded from Crabknowe Spit, 1958-61 and Colne Point as recently as 1978.

- W. kochi*, four records from saltmarshes, 1988.
W. acuminata, scattered records, probably widespread.
 * *Dicymbium nigrum*, few records.
 * *D. nigrum* f. *brevisetosum*, few records.
Entelecara acuminata, few records.
E. congenera, one record (Chalkney Wood, 1981).
 * *E. flavipes*, recorded from Grays, 1986 and 1987.
E. erythropus, three recent records.
Moebelia penicillata, only two recent records but probably widespread.
Hylyphantes graminicola, scattered records.
Gnathonarium denatum, scattered records, probably common.
 * *Tmeticus affinis*, one record (Cuckholds Haven, Barking, 1984).
Gongylidium rufipes, many scattered records.
Dismodicus bifrons, scattered records, probably widespread.
Hypomma bituberculatum, scattered records.
H. fulvum, only one old record but 1987 and 1988 records suggest that it is widespread in brackish Phragmites habitats.
H. cornutum, few records but probably widespread.
Metopobactrus prominulus, two old records and three recent records.
 * *Baryphyma pratense*, three records all since 1978.
B. duffeyi, two old records, several new 1987 and 1988 records.
 * *B. trifrons*, one record (Friday Woods, Colchester, 1981).
Gonatium rubens, scattered records.
G. rubellum, scattered records.
Maso sundevalli, rather few scattered records, but probably widespread.
Peponocranium ludicrum, four recent records.
Pocadicnemis punila, many scattered records.
P. juncea, rather few records, but probably common.
Oedothorax gibbosus, rather few records, but probably widespread.
O. gibbosus f. *tuberosus*, few records, but probably widespread.
O. fuscus, many scattered records, probably common.
O. agrestis, two old records, only one recent record (Kingsford Bridge Marsh, Roman River, 1983).
O. retusus, scattered records, probably common.
O. apicatus, scattered records.
Trichopterna cito, old record for Colne Point.
 * *Trichopterna thorelli*, three records since 1983.
Pelecopsis parallela, few records.
P. nemoralis, one record (Donyland Wood, 1986/7).
P. mediocris, recorded for Colne Point, 1958-61 and Crabknowe Spit, 1958-61 and 1987.
Silometopus elegans, two recent records (East Tilbury, 1985 and Stanford-le-Hope, 1987).
S. ambiguus, few records but probably common in saltmarsh habitats.
S. reussi, very few records.
Cnephlocotes obscurus, two recent records (Grays, and Thorndon Park, both 1986-7).
Trichonus hackmanni, recorded for Colne Point, as recently as 1984.
 * *Ceratinopsis stativa*, three records, since 1985.
Tiso vagans, scattered records.
Troxochrus scabriculus, few records.
 * *T. scabriculus* f. *cirrifrons*, one record taken with typical form at Stanford-le-Hope, 1987.
Tapinocyba praecox, few records, 1985-7.
 * *T. insecta*, three records (Writtle, Donyland and Stour Woods, all 1987).
 * *Microctenonyx subitaneus*, Grays, 1988.
Thyreosthenius parasiticus, one old record for Cattawade Marshes and a 1988 record for Hylands Park, Chelmsford.
Monocephalus fuscipes, scattered records.
Lophomma punctatum, rather few records but probably widespread.
Gongylidiellum vivum, scattered records, probably common.
 * *G. latebricola*, one record (Thorndon Park, 1986).
Micrargus herbigradus, few records but probably common.
 * *M. apertus*, few records but probably widespread.
 * *M. subaequalis*, eight records, all since 1984/5.
 * *Erigonella hiemalis*, recorded from Grays, 1986-7 and Westley Heights, 1988.
Savignya frontata, rather few scattered records, but probably widespread.
Diplocephalus cristatus, only recent records, but probably widespread.
Diplocephalus permixtus, few scattered records, but probably common.

- Diplocephalus latifrons*, few records, but probably widespread.
D. picinus, scattered records, probably widespread.
Araeoncus humilis, very few records.
**Panamomops sulcifrons*, recorded from Grays, 1986-7.
**Typhochrestus digitatus*, one record, Grays, 1987.
**Milleriana inerrans*, very few records, 1984/5-7.
Erigone vagans, four recent records in S.W. Essex.
E. dentipalpis, many records, common.
E. promiscua, only one recent record (Tiptree Heath, 1984/5).
E. atra, many records, common.
E. arctica, five recent records, 1984-1987.
E. longipalpis, few records, but probably common in tidal habitats.
**Donacochara speciosa*, one record (Pitsea Marsh, 1987).
**Leptorhoptrum robustum*, two records (Thorndon Park, 1986-7 and Purfleet Ranges, Rainham Marshes, 1987).
Drepanotylus uncatus, recorded for Essex in Vol. 3, L.M.&M.
Halorates reprobis, five recent records.
**Mioxena blanda*, one record (Crabknowe Spit, 1987).
Ostearius melanopygius, one old record and three recent records.
Porrhomma pygmaeum, few records, but probably widespread.
P. convexum, one recent record (Friday Woods, Colchester 1986).
P. microphthalmum, one old record for Colne Point and three recent records (St Osyth, 1985, Hockley Wood, 1986 and Stour Wood, 1987).
**Porrhomma egeria*, Westley Heights, 1988.
Agyreta subtilis, very few records.
**A. decora*, few records.
**A. conigera*, two records (Grays, 1986 and Aveley 1987).
Meioneta innotabilis, only six recent records but probably common.
M. rurestris, scattered records, probably widespread.
M. beata, one old record and a few recent records.
M. saxatilis, few scattered records, probably widespread.
**M. simplicatarsis*, one record (Purfleet Ranges, Rainham Marshes, 1987).
M. mollis, one recent record (Watts Wood, Thurrock 1987).
Microneta viaria, scattered records, probably common.
**Syedra gracilis*, two records (Grays, 1986 and Purfleet Ranges, Rainham Marshes, 1987).
Centromerus sylvaticus, scattered records, probably common.
**C. serratus*, two records (Tiptree Heath, 1984 and Grays, 1986).
**C. prudens*, one record (Tiptree Heath, 1985).
C. dilutus, very few records, but probably widespread.
Tallusia experta, rather few scattered records, but probably widespread.
Centromerita bicolor, rather few scattered records, but probably common.
C. concinna, few records, but probably common.
Sintula conigera, two recent records (Donyland Wood, 1987 and Friday Woods, 1988).
Saarietia abnormis, few records, but probably widespread.
**S. firma*, two records (Grays, 1986-7 and Thorndon Park, 1987).
Macrargus rufus, few records, but probably widespread.
Bathyphantes approximatus, scattered records, probably widespread.
B. gracilis, many records, common.
B. parvulus, rather few records but probably widespread.
B. nigrinus, rather few records but probably widespread.
Kaestneria dorsalis, few records.
K. pullata, rather few records, but probably widespread.
Diplostyla concolor, scattered records, probably common.
Poecilometes globosa, only four recent records.
Draetiscia socialis, scattered records, probably common.
Tapinopa longidens, five recent records but probably more common.
Floronia bucculenta, scattered records, probably widespread.
Labulla thoracica, rather few records but probably widespread.
Stemonyphantes lineatus, most records are near the coast or Thames.
Bolyphantes luteolus, one old record for Colne Point.
Lepthyphantes nebulosus, one old record and only one recent record (Grays, 1986-7), but probably widespread.
L. leprosus, one old record for Colne Point and one recent record for Manor Park, 1983 but probably widespread.

- L. minutus*, few records, but probably widespread.
L. alacris, very few recent records, but probably widespread.
L. obscurus, very few recent records, but probably widespread.
L. tenuis, many records, common.
L. zimmermanni, many records, common.
L. cristatus, two old records and two recent records (Donyland Wood, 1986 and Watts Wood, Thurrock, 1987).
L. mengei, rather few scattered records but probably widespread.
L. flavipes, scattered records, probably common.
L. tenebricola, only four recent records, but probably widespread.
L. ericaeus, scattered records, probably common.
L. pallidus, rather few records, but probably widespread.
L. midas, one record for Epping Forest, 1971.
Helophora insignis, very few records, but probably more widespread.
Linyphia triangularis, many records, common.
L. hortensis, scattered records, probably widespread.
Nerienne montana, rather few records probably widespread.
N. clathrata, many records, common.
N. peltata, scattered records, probably common.
N. furtiva, old records (1929-31) for Great Horkesley and ? Fordham.
Microlinyphia pusilla, scattered records, probably common.
M. impigra, rather few records from tidal habitats, probably more common.
Allomengea scopigera, rather few records from tidal habitats, but probably more common.
A. vidua, two recent records (Pitsea Marsh and Roman River, Donyland Wood, both 1987).

Note

LYCOSIDAE

Aulonia albinana, recorded by Hull (1950) in a mixed collection of spiders from the Colchester area but the specimens have never been traced (see *Bull. Br. arachnol. Soc.* 2: 175). As far as I know this record has never been accepted.

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Book Review

Flora of Surrey. Supplement and Checklist. By A. C. Leslie. Published by A. C. and P. Leslie, Guildford. 1987. 117pp. £5.00, post free from 72 Boxgrove Road, Guildford, Surrey GU1 1UD.

The usual supplement to a county flora is just a list of additions since the publication of the original flora. This book is much more than this. Not only does it cover the records supplementary to those given in J. E. Lousley's *Flora of Surrey* published in 1976, but also it provides a 10km-square distribution list for all species recorded in Surrey from 1950 and in addition lists all species which have ever been recorded in the county.

There are many 'new' species not mentioned by Lousley, including a large number of aliens, some of which are now well-established. Alan Leslie has an exceptional knowledge – he is of course a professional botanist – and he includes some useful notes on the status of many of the species, subspecies and hybrids.

This book contains an immense amount of information, bearing in mind its modest size and is the result of a tremendous amount of hard work. For those who are interested in Surrey plants, this must be regarded as an essential reference book.

R. C. STERN

Oxleas Wood: Observations on the Spiders, their Phenology and Ecological Strategies

by J. EDWARD MILNER*

Oxleas Wood

'...a large and very beautiful open space...'

(Mayor of Woolwich, 1934)

Summary

Oxleas Wood is well known as an important area of ancient woodland in southeast London; although the flora and much of the fauna has been recorded there are no spider records. The spider fauna of the Wood has been investigated over a two-year period, including a period of a year when trios of pitfall traps were set at seven sites. Data from the catches and from general collecting are given; a list of 92 species of spiders, one hymenopterous parasite, and two species of pseudoscorpions is detailed.

From the pitfall data observations of the phenology of the common species in the Wood have been made and these have been used to suggest three main ecological strategies present among the spider fauna.

Introduction

Oxleas Wood is an area of mature oak woodland in the Borough of Greenwich in south-east London. The Wood lies mostly on a southeast-facing slope of London Clay, and it is understood to be of ancient origin, at least several hundred years old.

Oxleas Wood, and the adjacent woodlands, Shepherdleas Wood, Jack Wood, and Eltham Common, are dominated by stands of pedunculate oak *Quercus robur* together with sessile oak *Quercus petraea* and several other species including wild service *Sorbus torminalis*, Midland hawthorn *Crataegus laevigata*, and wild cherry *Prunus avica*, which are very much less common in the London area (Burton 1983). Indeed Oxleas Wood and the other woodlands make up one of the 'most extensive and best surviving areas of ancient semi-natural woodland in Greater London' (Kirby 1982). In this context ancient woodland is defined as that which has not been clear-felled or otherwise removed since the year 1600.

In recognition of its importance for conservation, in 1984 a total of 72 hectares of woodland centred on Oxleas Wood was designated by the N.C.C. as an S.S.S.I. (Site of Special Scientific Interest) under the 1981 Wildlife and Countryside Act.

Many of the tree species are the native ones mentioned above but a number of introduced and alien species can now be found. One of the longest established incomers is the sweet chestnut *Castanea sativa* which has been in the area since Roman times and is now regarded by botanists as an 'honorary native' (Kirby *ibid.*). It is known that there was some clear-felling of the standard trees in the nineteenth century, and around the same time parts of the wood were replanted with native species.

Today the wood shows evidence of having been managed historically in a traditional coppice cycle, with many oaks allowed to mature as standards. According to Carruthers *et al.* (1986) the Wood was managed in this way until the Second World War.

In the 1920s the area was dubbed 'the Hampstead Heath of the South' (Crowe 1987), and conservation of the woodlands has been a priority. An area including

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Oxleas Wood was acquired in 1934 by the London County Council as an open space to be dedicated for public use in perpetuity. As the Mayor of Woolwich commented at the time 'it can be made an extraordinarily attractive park as a "lung" for South East London'. In spite of its preserved status Oxleas Wood is threatened at the time of writing by the plans for a major road development (the 'East London River Crossing'). Under this threat, several surveys and investigations of the Wood were made by the N.C.C. and as a result a great deal of ecological evidence was produced for a Public Enquiry about the proposed road development which was held from October 1985 to December 1986. (At the time of writing the Inspector's Report has yet to appear. Several of the papers quoted here are unpublished reports for that Enquiry).

During the last few years the Wood has been managed according to a detailed Management Plan which was prepared by the G.L.C. (1985) before its abolition and is now managed by the Leisure Services Directorate of Greenwich Borough. The management policy, while not the traditional system, has been relatively benign and it is now planned to re-establish coppicing. The character and ecology of the Wood must have changed somewhat in the 50 years since coppicing was abandoned (probably before the Second World War), and as a result of the cutting of a number of drainage ditches through the wood. Presumably this was done with the aim of easing public access; today the wood has a well-used system of footpaths, including part of the extensive 'Green Chain Walk' which extends from Thamesmead to Sevenoaks in Kent.

Ecologically this drainage system has lowered the water-table, to the likely detriment of both flora and fauna, especially the herb layer and the invertebrates. Conditions of the litter layer for example must have changed significantly. Some areas of the Wood still remain damp, and there are patches of standing water during winter months in some years. There is a pond at the southern corner of the wood (Figure 1), and a water-filled bomb crater near the middle of the wood.

Flora and Fauna

Using Peterken's classification of woodlands in Britain, Bale (1983) has identified one dominant type of vegetation, with smaller areas of three other types.

Much of the Wood is of a *lowland hazel-pedunculate oak wood* (Peterken's type 6Dc), and there are also smaller stands of *acid pedunculate oak-hazel-ash wood on heavy soils* (3Aa), and *pedunculate oak-hornbeam wood* (9Ab). There is a small area of *alder wood on mineral soils, neutral-alkaline form* (7Ab) in a low-lying part of the wood next to Shooters Hill.

Ecologically Oxleas Wood exhibits several characteristics of ancient woodlands, in particular its biological diversity. A total of 47 species of trees and shrubs has been recorded (Watts 1986). Altogether 121 species of flowering plant have been recorded (Curry 1986, Pitt 1982b), as well as 28 species of grasses (Pretty 1986), and 213 species of basidiomycete fungi (Pitt 1982a).

Much of the ground flora is characteristic of ancient and relatively undisturbed woodland, in particular: wood sorrel *Oxalis acetosellis*, wood sage *Teucrium scorodonia*, wood violet *Viola reichenbachiana* and bluebell *Endymion non-scriptus*.

The fauna is also diverse, though less well-known. Thirty-four species of bird are known to breed in the wood at present (Bealey 1986). Mickleburgh (*L.N.* 66) has reported two species of bats, and during this survey common shrew and woodmouse have been found by the author.

An assessment of the invertebrate fauna was made at the time of the Public Enquiry by McLean (1985) who noted that two species of beetle new to science had been found in Oxleas Wood, together with several Notable Species. The present list of Coleoptera recorded at the wood has reached around 420 (Allen

pers. comm.). Several other Orders of insect have produced rare and notable records at Oxleas Wood, and totals for Lepidoptera (250 species), Diptera (209 species) and Hemiptera (67 species) all include unusual species. However, other invertebrate groups 'have only been poorly investigated' (Maskrey 1986).

In this ecological context and in the absence of any spider records for the area it was thought that an investigation of the spider and pseudoscorpion fauna of Oxleas Wood was most urgently needed.

Materials and Methods

The writer first visited Oxleas Wood in September 1986 and since then general collecting has been done at infrequent intervals by searching, sifting leaf litter and beating trees and bushes. More systematic long-term sampling of the ground-living fauna has been made by pitfall-trapping over a period of 15 months from January 1987 to April 1988, and with a complete set of trap trios in the seven sites from April 1987 to April 1988.

Trapping has been similar to that conducted by the writer at Alexandra Park (and reported in *L.N.* 66), using standard polythene cups set in triangular configuration approximately 1m apart. In view of previous problems caused by excess rainwater on occasion, the traps at Oxleas Wood have been operated with small roofs made of zinc sheeting and disguised with a little leaf-litter. The traps contained a mixture of ethylene glycol (commercial anti-freeze), liquid detergent, water, and a little dilute formalin. The latter is to preserve large catches, for example of carabid beetles which tend to fill the traps and then start to rot rather quickly at certain times of year.

The traps were emptied at as regular intervals (of approx. three weeks) as possible throughout the year. As might be expected they met with fewer accidents than the traps at Alexandra Park had done and the main problem affecting catches was the tendency of the Hollow site to flood in the winter months.

The pitfall sites were chosen in the southern part of the Wood as shown in the map (Figure 1):

Relatively open and partially disturbed sites (Figs 5-6)

1. Pond. In the dense vegetation, mainly *Glyceria* sp. and *Juncus* sp. at the margin of the pond. The site chosen was just above the highest point reached by the water level. The height of this vegetation changes from a few centimetres of dead reed stems to around 1 metre when the pondside vegetation is fully grown.

2. Coppice. In an area of coppiced sweet chestnut with mature pedunculate oak trees and a well-developed herb layer of wood sage, grasses and bramble (6Dc woodland).

Sites at the base of large trees (Fig. 7)

3. Old Oak. A relatively undisturbed site in dense leaf litter around the base of a mature pedunculate oak tree in a part of the wood dominated by oak and with a dense ground cover of bramble (6Dc woodland).

4. Oak. See below.

Sites in the middle of the wood (Fig. 8)

4-7 Oak, Path, Bramble and Hollow. Four sites approx. 10m apart in a floristically diverse part of the wood under mixed age oak, hazel, birch, sweet chestnut and other tree species. The ground flora is also varied and there is a well developed leaf-litter layer (3Ab woodland). Oak and Path are within 2 metres of a little used path, Hollow and Bramble are 5-6 metres from the path.

4. Oak is in deep leaf-litter around the base of a mature pedunculate oak.

5. Path is under a previously coppiced hazel.

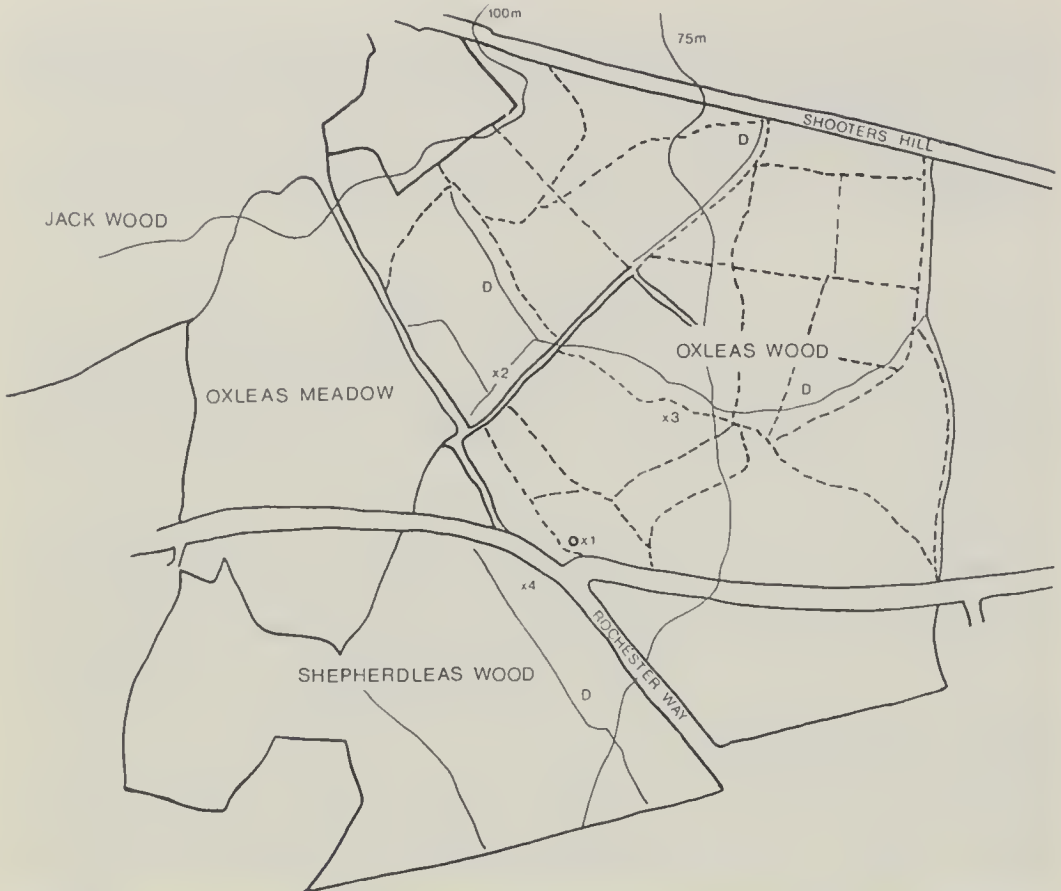


FIG. 1. Map of Oxleas Wood and Shepherdleas Wood. D = drain (see picture, Fig. 4), x = pitfall sites. 1, Pond and Coppice. 2, Old oak. 3, Oak, Path, Bramble, and Hollow. 4, Shepherdleas.

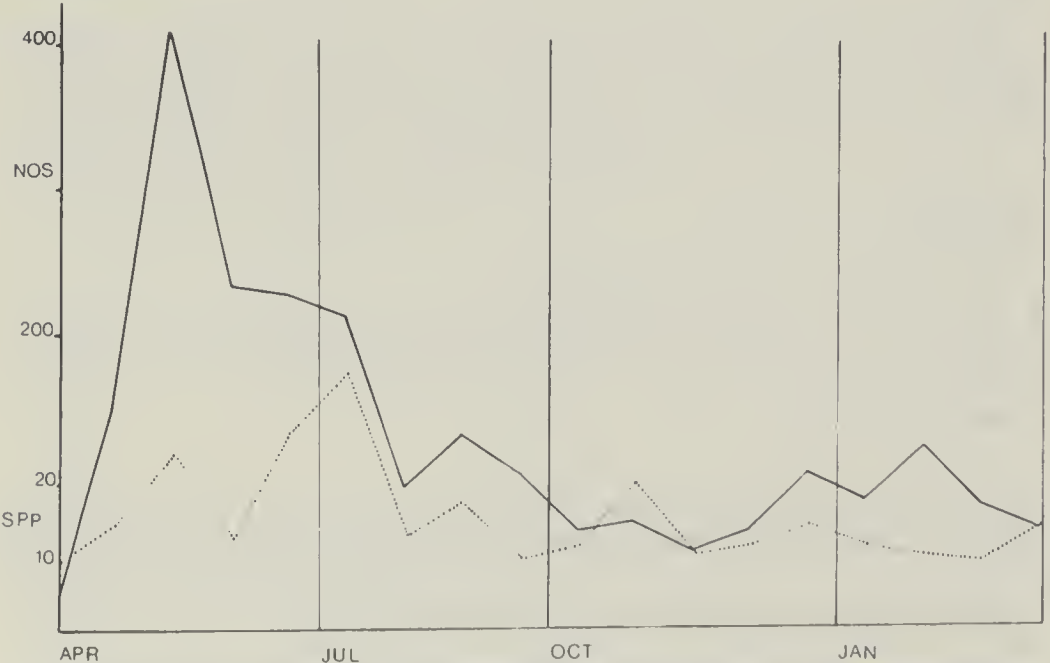


FIG. 2. Variation in numbers and species during the trapping period. (Figures from Table 1 corrected to 100TN for each catch date).

6. **Bramble** is in litter under a sparse bramble cover.

7. **Hollow** is in a small natural hollow 5 m from Path but with deeper leaf litter. The site is prone to flooding in the winter months and at such times the pitfall cups float and do not function properly.

Sites 5 and 6 are the nearest sites comparable with two woodland sites investigated by the author at Alexandra Park, except that the predominant ground flora species at Alexandra Park, common ivy *Hedera helix* is absent from the pitfall trap area at Oxleas Wood.

8. **Shepherdleas**. For a shorter period than the main survey period (October 1987 to April 1988) a trio of pitfalls was also set in Shepherdleas Wood as indicated in Figure 1.

Single traps were also set for shorter periods in a grass tussock ('Tussock') near Old Oak site, and under a holly tree adjacent to the Oak site ('Holly').

Results

As a result of all collecting and the pitfall trapping a diverse and unusual fauna has been found totalling 92 species (57% linyphiids). Several of these are new records for the County of London, but as new records are still being added, the species list is clearly far from complete. Much of this list is of common and widespread species, but the exceptional nature of the wood as a habitat is indicated by the fact that in the present list 14 species (15%) are known from no other sites in the County of London. The nomenclature follows Merrett *et al.* (1985).

Of these arachnological jewels perhaps the most interesting species seen so far is *Wiehlea calcarifera*, a tiny, pale-grey, erigonine linyphiid, designated as a Notable Species A by the Nature Conservancy Council. Three male specimens were taken in the wood in March 1988 from pitfall trios Pth and Oak. Until now this spider had never been found outside the Wessex Region (Devon, Dorset and Hampshire), and indeed the few existing records only date since the mid 1950s (Locket *et al.* 1974).

Walkenaeria furcillata, also a first record for London, is known as an uncommon heath species, and these Oxleas Wood records (3 males at site Coppice) are surprising. *W. furcillata* has more recently been found at Sydenham Hill Wood (Harvey pers. comm.).

Sintula cornigera is another new record for London. According to Locket and Millidge (1951-3) it occurs 'in moss, grass, sphagnum etc., in wet and swampy areas. Widespread but rare.' A total of nine males and one female have been taken in the pitfall traps at Pond and Coppice.

Perhaps the most spectacular find was a male of *Micrommata virescens* at site Path in July 1987. This species had previously only been recorded for the County of London in 1736 by Edward Albin, an early London naturalist. The Society issued a Press Release about the 1987 find and it was subsequently publicised by the National and local Press ('Rare spider could bring road scheme to a halt' *The Independent* 22.9.87, and 'Rare spider in path of new road' *The Guardian* 22.9.87). Whether these comments were premature cannot be determined at the time of writing.

A total of nine different species of *Lepthyphantes* have been recorded from the Wood (several of them new to London), the largest number of this genus from any site in London.

A complete list of all the species so far recorded is given below (page 115), together with notes about when and where they were found.

Pitfall Results

Pitfall trapping at the seven main sites was done from April 1987 to April 1988 and a total of 1,526 individuals representing 74 species were taken. A further 5 species were taken in the pitfall traps outside the study period, making a total of 79 species of which 50 (63%) were linyphiids. Table 1 shows the basic counts for the four seasons, while Table 2 shows details of all catches for some of the most frequently found species.

TABLE 1. Seasonal variation; A by numbers, B by species.

A – Spider Numbers

	SPRING Apr.-June	SUMMER July-Sept.	AUTUMN Oct.-Dec.	WINTER Jan.-Mar.	Total
Total trap-nights	315	264	294	276	
1. Pond	119	51	49	28	247
2. Coppice	259	47	26	19	351
3. Old Oak	63	83	54	35	235
4. Oak	96	76	27	25	224
5. Path	42	67	14	60	183
6. Bramble (Lids)	73	45	28	54	200
7. Hollow	25	23	15	23	86
Total	677	392	213	244	1526

B – Spider Species

1. Pond	20	17	12	6	32
2. Coppice	21	17	11	6	33
3. Old Oak	14	15	13	12	31
4. Oak	20	9	6	7	24
5. Path	15	14	7	9	27
6. Bramble (Lids)	14	12	10	6	21
7. Hollow	9	7	6	5	16
Total spp. taken	46	46	28	19	(72)
% of total	64%	64%	39%	26%	

The pitfall method favours the ground- and litter-inhabiting species; several of the species not found in the pitfall traps have been collected from beating vegetation, or by using a sweepnet. As the traps were all placed some way from the edges of the wood very few of the common pioneer species of temporary habitats such as *Erigone dentipalpis*, *E. atra*, *Oe. fuscus* have been recorded, although they are undoubtedly to be found around the edges of the Wood.

The greatest numbers of spiders were found in the early summer (May-June), and as the writer reported at Alexandra Park (Milner 1987b), a second minor peak in numbers was evident in the winter months (Figure 2).

Differences between the pitfall sites appear to be relatively minor, with the exception of the damp Pond site where the fauna is slightly different, *Bathypantes gracilis* being the commonest species (Table 3). The Hollow site is prone to flooding which rendered the traps inoperative from time to time, especially in the winter; this must have depressed the winter figures somewhat. However each site, including Hollow, produced some species not found at any other site and indeed 37 species or half the total were taken at one site only (Table 1B). This is remarkable as four of the sites (Oak, Path, Hollow and Lids) are all within about 10 metres of each other. However it seems that short distances and apparently very minor differences of habitat make a great deal of difference to some spider species.

So which are the commonest spiders in the wood? In trying to answer this question the complexities of the spider population start to emerge. Table 3 gives the three species taken in the largest numbers from all sites aggregated for each season, and then for the whole year at each pitfall site. Five species were recorded

TABLE 2. Seasonal variation of the most frequent species (figures are for pitfall trios).

Catch No. Trap-nights (TN) Date	1987										1988												
	1 3/1	2 15/2	3 28/2	4 15/3	5 5/4	6 20/4	7 9/5	8 30/5	9 28/6	10 27/7	11 17/8	12 29/9	13 11/10	14 7/11	15 21/11	16 15/12	17 31/12	18 24/1	19 14/2	20 5/3	21 1/4	22 24/4	23 15/5
<i>L. zimmermanni</i> E	0-4†	1-2	0-1	0-4	0-1	1-10	2-5	(2-2)	5-7	23-32	19-20	23-22	7-6	7-7	0-8	1-4	1-1	0-2	0-2	0-2	1-6	3-8	3-5
<i>M. viaria</i> S	—	—	1-0	—	1-0	22-2	132-7	15-6	2-11	0-11	0-5	0-1	—	0-1	0-1	—	—	—	1-0	1-0	0-1	15-2	22-3
<i>W. acuminata</i> E	13-1	3-1	5-3	1-1	3-3	0-5	0-7	0-6	1-6	1-14	0-2	1-2	1-4	1-4	0-1	4-0	12-1	11-2	6-1	5-3	1-8	0-1	0-3
<i>L. flavipes</i> E	—	1-0	—	—	0-1	0-1	0-6	0-4	8-4	5-4	2-2	4-4	3-0	11-3	0-6	7-3	1-0	0-3	1-3	0-1	1-3	2-3	2-1
<i>M. rufus</i> W	3-0	16-2	25-4	7-1	1-0	0-6	5-4	—	0-6	0-1	—	0-1	0-3	0-1	—	—	0-1	12-5	42-8	13-8	1-8	0-7	0-2
<i>D. pictus</i> S	—	—	—	—	—	—	15-2	77-5	68-22	7-10	—	—	—	—	—	—	—	—	—	—	—	—	2-0
<i>B. gracilis</i> S	—	—	—	—	—	—	—	—	3-0	8-6	1-0	3-2	1-1	2-3	0-3	5-1	9-9	11-4	1-1	—	2-2	—	—
<i>Coe. terrestris</i> S	—	1-0	—	—	—	0-1	0-3	—	0-1	0-1	1-0	25-1	29-0	1-0	—	—	—	—	—	0-1	—	—	—
<i>H. insignis</i> W	0-10	1-4	—	0-2	1-0	0-1	—	—	—	—	—	—	—	0-5	0-1	2-6	0-1	1-3	0-6	1-6	1-5	—	—
<i>C. dilutus</i> W	1-0	1-0	—	—	—	—	—	—	0-2	0-2	—	—	—	—	—	8-0	4-0	1-0	3-0	3-3	1-2	0-3	0-1
<i>L. clathrata</i> S	—	—	—	—	1-0	5-0	3-0	2-3	4-3	0-3	0-1	—	0-1	0-1	—	—	—	—	—	—	3-0	2-0	—
<i>P. lugubris</i> S	—	—	—	—	—	—	18-9	4-13	0-5	0-2	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>H. helveola</i> W	1-0	—	—	—	1-0	(0-1)	—	—	—	—	—	—	—	1-0	—	5-0	2-0	2-0	1-0	0-4	—	—	—
<i>L. tenebricola</i> S	—	—	—	—	—	—	—	1-1	4-13	2-1	0-2	—	—	—	—	—	—	—	—	—	—	—	—
<i>Club. terrestris</i> E	—	0-1	1-0	—	—	1-0	(8-1)	—	1-0	1-0	1-0	2-1	3-2	1-0	—	—	—	—	—	—	—	—	—
<i>M. herbigradus</i> ?	—	—	—	—	—	—	1-0	—	4-1	2-0	—	1-1	1-0	—	1-0	—	—	—	0-1	—	1-0	4-1	1-1
Other spp.	—	0-1	1-1	2-1	—	8-5	15-6	2-3	5-11	16-35	6-1	5-3	4-2	3-4	—	4-1	4-2	0-2	0-1	1-1	4-1	7-4	5-4

Total for period 5/4/87 to 1/4/88 = 1526 individuals, 72 spp.

Study period Catch Nos 5-21.

†Key to numbers, e.g. 1-2 = 1 male, 2 females.

E = Eurychronous species.

S = Stenochronous species.

W = Winter-mature species.

* = totals not given as only four pitfall sites operating.

() = present in other pitfall catches outside main seven.

from all the pitfall sites and these are therefore the most widespread species in the wood:

<i>Leptyphantes zimmermanni</i>	<i>Microneta viaria</i>
<i>Leptyphantes flavipes</i>	<i>Macrargus rufus</i>
<i>Walckenaeria acuminata</i>	

but at any particular time of year these may not be the most frequent species present.

TABLE 3. The commonest species.

A – by pitfall site.

	Total						
Pond	247	<i>B. gracilis</i>	28.5%	<i>D. picinus</i>	20.9%	<i>L. zimmermanni</i>	6.4%
Coppice	351	<i>D. picinus</i>	33.6%	<i>M. viaria</i>	16.5%	<i>P. lugubris</i>	11.8%
Old oak	235	<i>L. zimmermanni</i>	20.0%	<i>L. flavipes</i>	16.2%	<i>M. viaria</i>	14.9%
Oak	224	<i>L. zimmermanni</i>	38.8%	<i>M. viaria</i>	18.7%	<i>W. acuminata</i>	8.9%
Path	183	<i>L. zimmermanni</i>	16.4%	<i>M. rufus</i>	14.7%	<i>W. acuminata</i>	12.6%
Bramble	200	<i>M. viaria</i>	22.0%	<i>M. rufus</i>	21.0%	<i>L. zimmermanni</i>	10.0%
Hollow	86	<i>L. zimmermanni</i>	21.2%	<i>M. rufus</i>	14.1%	<i>M. viaria</i>	12.9%
Total	1,526	<i>L. zimmermanni</i>	14.5%	<i>M. viaria</i>	14.3%	<i>D. picinus</i>	13.5%

B – by season.

Spring	677	<i>M. viaria</i>	29.2%	<i>D. picinus</i>	27.9%	<i>P. lugubris</i>	7.2%
Summer	392	<i>L. zimmermanni</i>	36.8%	<i>Coe. terrestris</i>	14.1%	<i>B. gracilis</i>	5.4%
						<i>L. flavipes</i>	5.4%
Autumn	213	<i>L. zimmermanni</i>	17.2%	<i>L. flavipes</i>	15.8%	<i>B. gracilis</i>	15.3%
Winter	244	<i>M. rufus</i>	39.8%	<i>W. acuminata</i>	15.1%	<i>H. insignis</i>	9.4%
Total	1,526						

As Table 1B shows, even when spider numbers peak in the spring (April-June) only two thirds (64%) of the species known to occur in the wood are to be found as adults. A different two-thirds is present as adults later in the summer, but this is the highest proportion of the species present that can be found in any one season. Table 3 shows that in the four seasons three different species are successively the most abundant one present: *M. viaria* in spring, *L. zimmermanni* in summer and autumn, and *M. rufus* in winter.

Peaks in the numbers of individual species tend to be much higher in the summer than at other times of year, presumably because the food supply (e.g. small insects) is greater then, but the effect of this is perhaps to overestimate the importance of summer-active species in looking at the fauna of the Wood as a whole (Figure 1). There is an important winter-active fauna in the Wood and these spiders were hardly seen in the summer at all (Table 3B). In fact most of the commonest spiders in the wood showed peaks in different months:

Dec.-Jan.	<i>W. acuminata</i>
Feb.-Mar.	<i>H. insignis</i> and <i>M. rufus</i>
Apr.-May	<i>M. viaria</i>
May	<i>P. lugubris</i>
June	<i>D. picinus</i>
July	<i>L. zimmermanni</i>
Sept.	<i>Coelotes terrestris</i>

As these peaks were due mostly to the appearance of large numbers of adult males it is assumed that they coincided with the main breeding periods. From this it clearly follows that several species in the wood are winter breeding

The major species in the wood have been scored for NxO and N/O and ranked in order of NxO in Table 4. *Leptyphantes zimmermanni* scored almost double the next species *Microneta viaria* and is clearly the commonest species in the wood throughout the year. In terms of numbers the pitfall results suggest that *M. viaria* and *D. picinus* are the commonest species, but both these can only be found as

adults for a limited period of the year. More frequently found are *Walckenaeria acuminata* and *Lepthyphantes flavipes*, but never in large numbers. In the late winter or early spring *M. rufus* is often found outnumbering all other species. In coppiced areas where sunlight reaches the ground lycosids can be common; at Oxleas Wood the species involved is mainly *Pardosa lugubris*.

TABLE 4. The Dominant Species.

	Nos.	Occ.	N×O	N/O	Max.	Mm
<i>L. zimmermanni</i>	235	79	18,565	2.9	33	Aug.
<i>M. viaria</i>	220	43	9,460	5.1	75	May
<i>W. acuminata</i>	115	65	7,475	1.8	14	Jan.
<i>L. flavipes</i>	91	58	5,278	1.6	14	June
<i>M. rufus</i>	126	38	4,788	3.3	13	Feb.
<i>D. picinus</i>	206	19	3,914	10.8	98	May
<i>B. gracilis</i>	78	19	1,482	4.1	33	Dec.
<i>Coelotes terrestris</i>	64	23	1,472	2.8	31	Sept.
<i>H. insignis</i>	40	21	840	1.9	14	Jan.
<i>C. dilutus</i>	29	20	580	1.5	4	Dec.
<i>L. clathrata</i>	30	19	570	1.7	9	Apr.
<i>P. lugubris</i>	51	10	510	5.1	46	May
<i>H. helveola</i>	17	12	204	1.3	4	Dec.
<i>L. tenebricola</i>	24	8	192	3.0	17	June
<i>Clubiona terrestris</i>	13	11	143	1.3	5	Oct.
<i>D. concolor</i>	15	8	120	1.9	8	July
<i>M. herbigradus</i>	13	8	104	1.6	9	June
<i>G. rufipes</i>	10	7	70	1.6	5	May
<i>L. tenuis</i>	8	6	48	1.2	—	—
<i>S. cornigera</i>	10	4	40	2.5	11	May
<i>R. lividus</i>	6	6	36	1.0	—	June
<i>M. sundevalli</i>	5	5	25	1.0	—	—
<i>M. fuscipes</i>	4	4	16	1.0	—	—
<i>Oe. gibbosus</i>	16	1	16	16.0	18	July

* = catches corrected to 100TN (Trap-Nights).

Mm = month with max no of males present in catches.

The detailed catch figures suggest that there may be not only absolute differences of success, but also differences in ecological strategy. The relative abundance of common species does differ slightly between the rather similar pitfall sites (none of which was at marginal or very disturbed places), but the consistent differences in pattern between species suggests differences of habit.

L. zimmermanni shows the highest number of individuals trapped, and was also trapped more frequently than other species. *W. acuminata* and *L. flavipes* were taken almost as many times but in smaller numbers; the mean number of individuals per catch (N/O) being 1.8 and 1.6 respectively, whereas for *L. zimmermanni* it was 2.9. The mean number per catch is very different for some other species; *P. lugubris* 5.1, *M. viaria* 5.1 and *D. picinus* 10.8; in other words the average catch for *D. picinus* in a group of three traps over a three-week period was almost eleven specimens. For a complete list of numbers and occurrences of the dominant species see Table 4.

Parasites

The larvae of hymenopterous ectoparasites have been found on adult females of three species of *Lepthyphantes*, quite commonly in early January and in April 1987 (66% and 45% parasitism of *L. zimmermanni* for the catches on the two dates), and at other times throughout the year. Only one parasitised juvenile spider has been taken.

		No. parasitised	total*
<i>L. zimmermanni</i>	20.12.86	1	1
<i>L. zimmermanni</i>	3. 1.87	4	6 (66%)
<i>L. tenuis</i>	5. 4.87	1	1
<i>L. zimmermanni</i>	20. 4.87	5	11 (45%)
<i>L. flavipes</i>	20. 4.87	1	1
<i>L. zimmermanni</i>	9. 5.87	1	9
<i>L. flavipes</i>	26. 8.87	1	5
<i>L. zimmermanni</i>	12. 9.87	2	28
<i>L. zimmermanni</i>	7.11.87	1	5
<i>L. zimmermanni</i>	1. 4.87	1	7

* = total for all traps for this species on that date

The parasite is likely to be the pimpline ichneumonid *Acrodactyla degener* according to Shaw (pers. comm., and Fitton *et al.* 1987), who has successfully reared adults wasps of this species from linyphiid hosts. These records of *A. degener* from *L. flavipes* appear to be the first ones published.

Pseudoscorpions

While searching litter and examining pitfall catches a number of pseudoscorpions have been found, and these have been identified by Dr G. Legg, of the Booth Museum in Brighton. Two species are represented, *Chlthionius ischnocheles*, and *Neobisium muscorum*. Both have been taken at most sites except Pond. and at most times of year, with minor peaks in June-August and October.

Ecological Observations

The data obtained from this long-term pitfall trapping show that the species occurring in the wood have very different phenologies, and following the ideas put forward in recent years by a botanist, Grime (1974, 1979), and followed by various zoologists, it is suggested that three ecological strategies can be recognized.

Three standard phenologies are recognised in spiders (Aitchison 1984):

1. *EURYCHRONOUS*, (E) having adults present in all seasons so that the reproductive period may not be fixed.
2. *STENOCHRONOUS*, (S) adults present only at certain times of year.
3. *WINTER-MATURE*, (W) with reproduction occurring at low temperatures.

From the data given in Table 2 it looks as if all three groups are represented among the most frequently found 13 species in the wood. From the available data it would seem that the following species are:

WINTER MATURE: *Macrargus rufus*, *Helophora insignis*, *Hahnia helveola* and *Centromerus dilutus*.

EURYCHRONOUS: *Lepthyphantes zimmermanni*, *Lepthyphantes flavipes*.

STENOCHRONOUS: *Pardosa lugubris*, *Lepthyphantes tenebricola*, *Microneta viaria*, *Diplocephalus picinus*, *Linyphia clathrata*.

Walckenaeria acuminata and *Bathypantes gracilis* appear to be intermediate *EURYCHRONOUS-WINTER MATURE* species.

Merrett (1969) who investigated the phenology of spiders in a Dorset heathland, separates a fourth group of species in which there is a peak of males just after winter (February-March or into April). In this group he includes one of the common species at Oxleas Wood, *C. dilutus*, and he suggests that they 'may be slightly less well adapted to the cold' (than the main Winter-Mature species).

An ecological theory developed by Grime (1974, 1979) and a team of botanists at Sheffield University postulates that organisms pursue different strategies which are a product of three dimensions; *competition*, *environmental stress*, and *disturbance*. A number of entomologists have begun to use this theory and the writer suggests that it may be applicable to the data obtained for spiders in Oxleas Wood, even though the disturbance dimension is not as well represented as the

other two. Some observations from Alexandra Park (L.N. 66) are included in this section, as this is and has been historically a much more disturbed locality.

Using Grime's approach, three Strategies can be identified which can be placed towards the apices of a triangle diagram (see Figure 9).

STRATEGY A:

Mainly WINTER-MATURE and some EURYCHRONOUS species.

Typical species: *Walckenaeria acuminata*, *Lepthyphantes flavipes*, *Helophora insignis*, *Centromerus dilutus*.

Some of these spiders can be found at all times of year in the Wood, but their population appears to fluctuate relatively little with the seasons (Table 2, Figure 3). Although there are more records for *W. acuminata* from the summer six

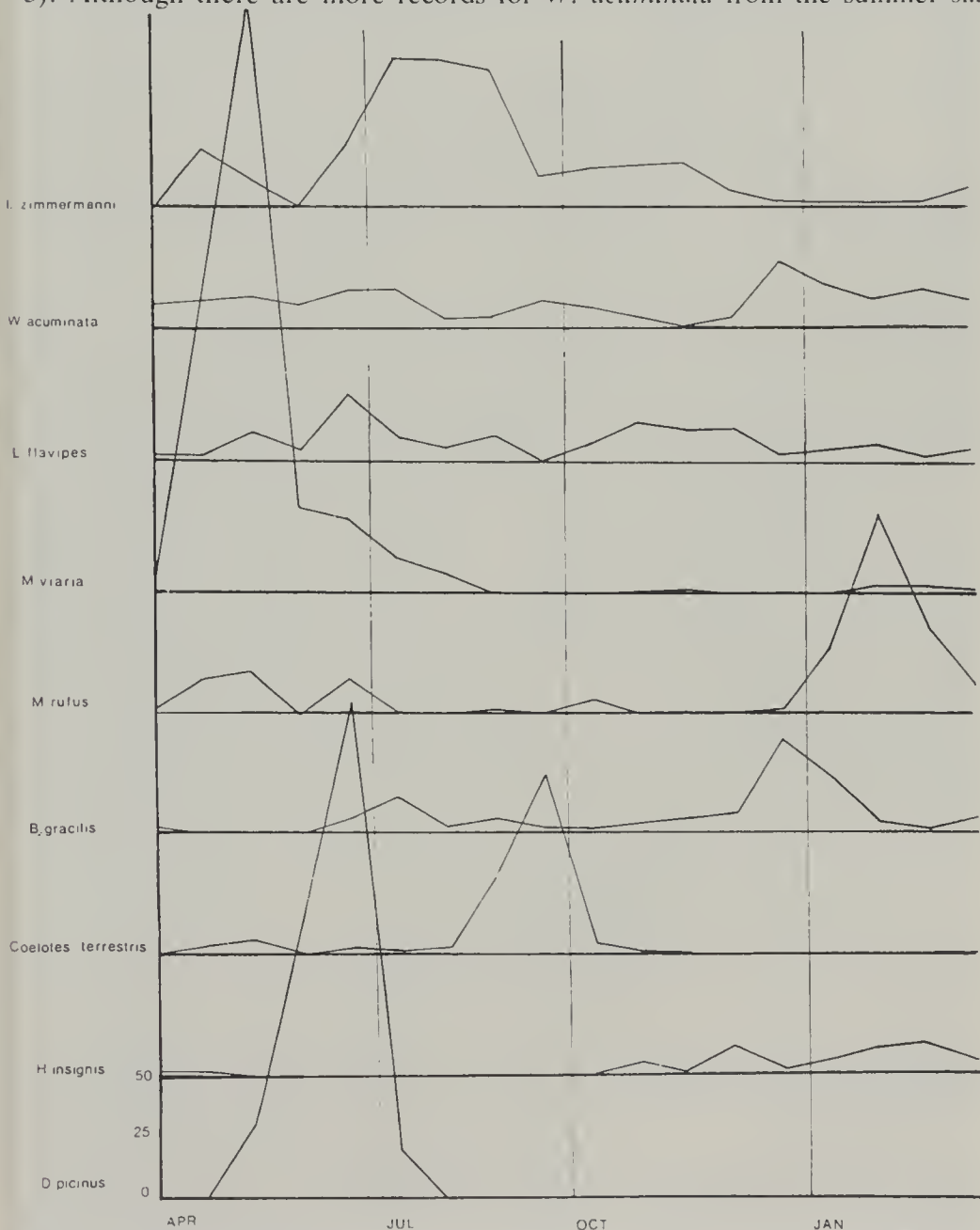


FIG. 3. Seasonal variation in activity of 9 major species. (Figures from Table 1 corrected to 100TN for each catch date).

months than the winter six months (34-31), males are much more frequent in the winter and the numbers of males do show a clear peak with almost half the males recorded being caught in a single month (January). This coincides with findings reported by the author for *W. acuminata* in Alexandra Park (Milner 1987b) '*W. acuminata* and *B. gracilis*. . showed marked peaks in the winter.' Merrett (1969) found the same pattern for *W. acuminata* in a Dorset heathland. *B. gracilis* has a peak of males in December-January, with another minor one in July.

A second group of more extreme stress-tolerant species are the *WINTER-MATURE* species in which mature individuals of both sexes appear to be absent for much of the warmer part of the year. It is possible that species such as *Helophora insignis*, and possibly *Centromerus dilutus* and *Hahnina helveola* largely 'over-summer' as juveniles.

This strategy could be described as '**stress-tolerant**'; the spiders being more active and breeding during periods when temperatures are at their lowest. It may be that these species are very catholic feeders or prey on animals that are present all year round such as *Collembola* (springtails) which are very common in the leaf-litter. Another factor may be the relative inability of these spiders to compete with other more vigorous species when temperatures are higher.

STRATEGY B:

STENOCHRONOUS species

Typical species: *Pardosa lugubris*, and *Microneta viaria*. *Linyphia clathrata*, *Lepthyphantes tenebricola*.

Many spiders, of which the wolf spider *Pardosa lugubris* is a ground-living example, appear to overwinter as juveniles or sub-adults. Adult spiders are found only in the summer (and not overlapping at all with some of the *WINTER-MATURE* species), with peaks of activity usually observable in May-June when abundant prey (small insects) is available. Adults of these species have been found by searching until at least September. These species typically also breed in the early summer, sometimes also later in the year in August or September; for instance various authors have noted that lycosid spiders such as *Pardosa* spp. often raise a second brood in late summer.

The pattern of catches for *P. lugubris* and *M. viaria* are consistent with this strategy (Figure 1), although with only one pitfall site in the open coppiced area the total numbers for *P. lugubris* are rather low; the species is very common in the clearings and other open areas in the wood.

This strategy could be termed the '**competitor**' – expenditure of energy is concentrated at the most advantageous period and success is presumably due to successful competition with other predators. Such species may in fact actually prey on other spiders (including both stress-tolerant and Strategy C species).

STRATEGY C:

These may appear to be extreme *STENOCHRONOUS* species.

Typical species: *Diplocephalus picinus*, *Oedothorax gibbosus*, and pioneer species such as *Erigone atra*, *Milleriana inerrans*, and possibly other *Oedothorax* spp. such as *Oe. fuscus*.

The third strategy is discernible among the spiders at both Oxleas Wood and at Alexandra Park, for example by the tiny *Diplocephalus picinus*. This erigonine spider exhibits an extraordinary catch profile which can look like an extreme version of Strategy B (see Figure 1 and Table 2), but lasting for a shorter period. At Oxleas Wood *D. picinus* is the third most abundant species, yet all its occurrences were recorded in three summer months, with nearly half of all the individuals being trapped in a single month. No other adults have been found inside Oxleas Wood at other times of year. At Alexandra Park the writer reported (L.N. 66) an even more extreme peak of 80% of the total year's catch on a single occasion.



FIG. 4. An artificial drain.



FIG. 5. The Pond site.

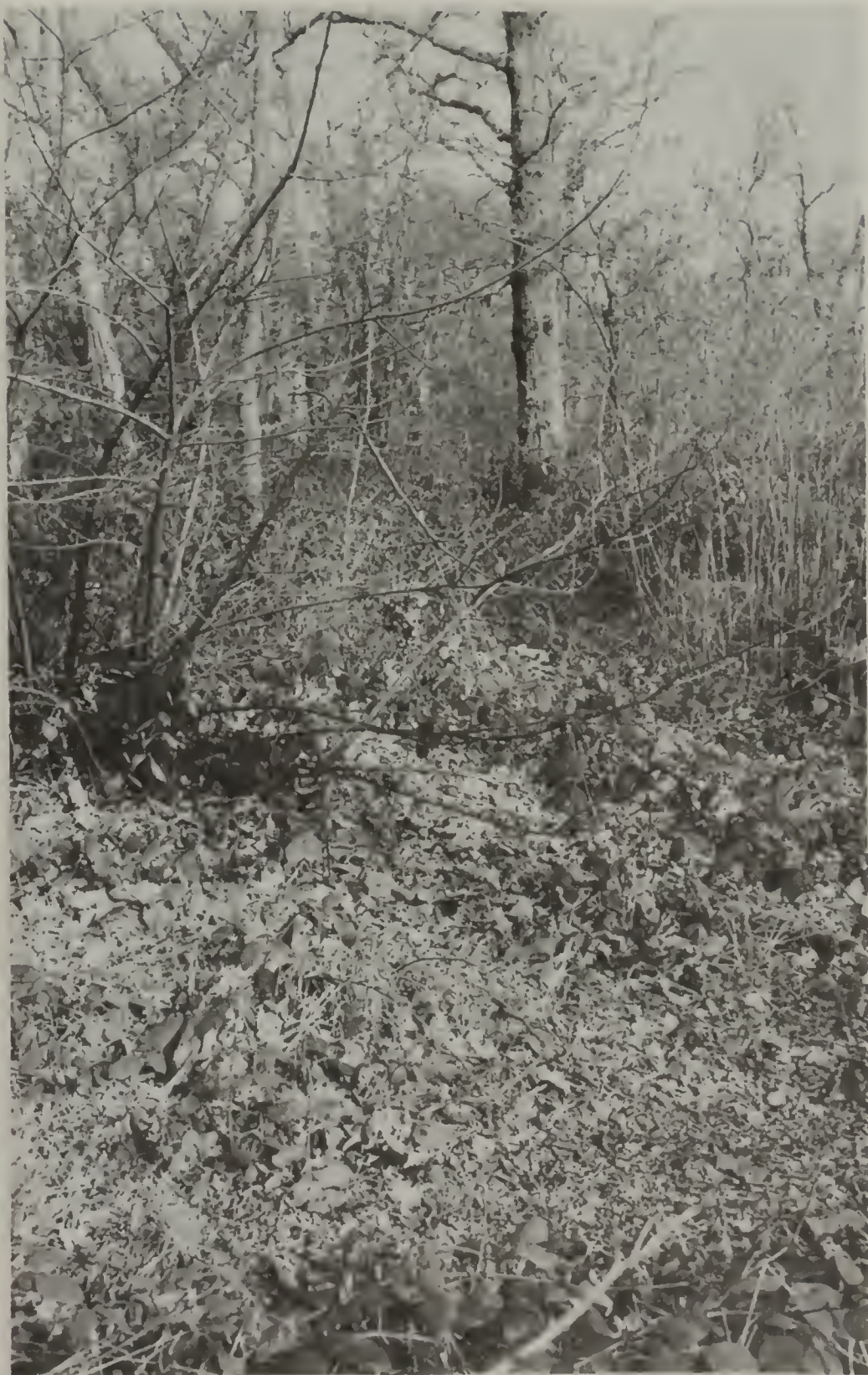


FIG. 6. The Coppice site.



FIG. 7. The Old Oak site.



FIG. 8. Area including the Path, Bramble, Oak, and Hollow sites.

A number of other occurrences are similar:

Oxleas Wood, 1987 *Oedothorax gibbosus*

A single catch in July at one site of 16 individuals being the total catch for the year.

Alexandra Park, 1985 *Erigone atra*

A catch of 19 (September) from a total of 20 for the year.

Alexandra Park, 1985 *Milleriana inerrans*

A single catch of 31 (September) being the total for the year.

These figures suggest that the species involved are able to exploit short-term conditions that favour them, but this success is generally short-lived. They are 'pioneers' perhaps the equivalent of 'weeds' or ruderal species. The fact that their success is usually short-lived may be due partly to predation by other species: in the summer months by competitors and in the autumn and winter months by stress-tolerant species.

Some of these species although only recorded at a particular site for a very short time can be found in other places at other times of year, which suggests that the group includes *EURYCHRONOUS* species appearing to be *STENOCHRONOUS*. For instance in highly disturbed habitats or artificial ones such as garden lawns, pioneer species may be found at all times of year.

In a particularly hard winter one would expect the extreme stress-tolerant spiders to do relatively well, although total numbers might be lower than average. In a better than average summer when insect population levels were higher than usual one could expect the competitors to do even better in terms of numbers; in a wet or cold summer the stress-tolerant spiders or possibly some of the pioneers could flourish at the expense of the competitors, as they might do in a very mild winter. Pioneer spiders could be expected to benefit from extra disturbance such as trees blowing down opening the wood's canopy, immediately after coppicing, or in mild periods during winter. Some species may show a combination of strategies, possibly changing in their role in relation to other species at different times of year.

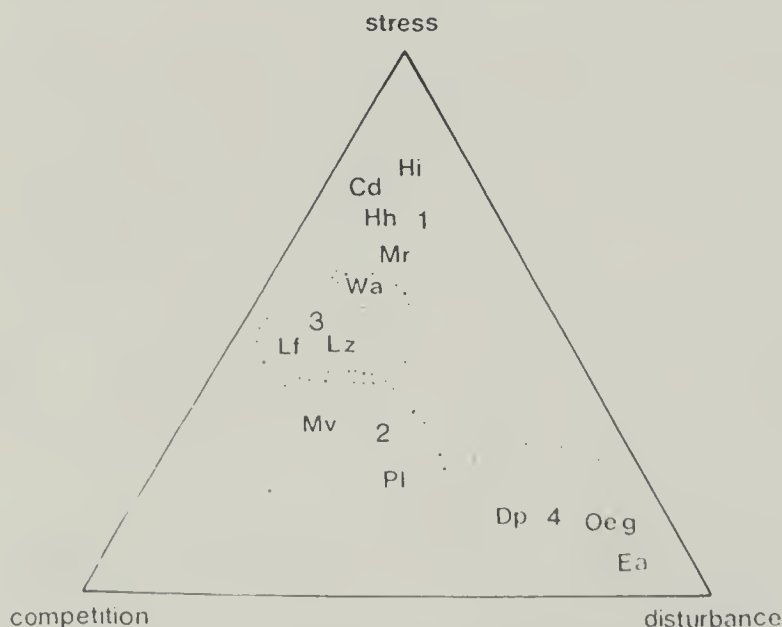


FIG. 9. Triangular diagram (after Grime). Group 1: Stress-tolerant species. Group 2: Competitors. Group 3: Intermediate stress-tolerant competitors. Group 4: Pioneers, ruderals. Spiders are given by initials and refer to species given in Table 2, with the addition of *Oedothorax gibbosus* and *Erigone atra*.

Final Comments

Observed frequencies of the spiders at Oxleas Wood suggest that the spider community is well adapted to the habitat in the wood, a complex interaction resulting in a succession of activity peaks which could be expected to make very good use of the food supply at all times of year. Clearly absolute numbers will vary from season to season and year to year successively favouring different strategies, but the scarcity or absence of many common pioneer species does indicate a relatively undisturbed and mature community. This idea is strengthened by the presence of a number of scarce, and for London, unusual species. It is probable that spiders are sensitive indicators of the quality of an environment to invertebrates in general; a rich spider fauna indicates a rich general fauna.

If there are to be changes in the management of the wood, as by the restoration of the original drainage or by rotational coppicing, then the spider fauna is likely to change, but in the long term to improve in diversity and resemble more and more the likely true historical fauna.

It is to be hoped that the protection of this wood, supposedly guaranteed in perpetuity, can be confirmed. Destruction of a major part of the wood has been threatened for nearly a decade by the Department of Transport who plan a major road development (Pye-Smith 1981). It is still a most beautiful stretch of traditional English woodland, one of the most characteristic elements of our natural heritage. Such habitats have been destroyed and damaged to such an extent that the loss of any of the remaining fragments or their diminution by our actions raises a fundamental question about our understanding of and attitude towards the natural world; a world that, even with the technology of the computer and the Channel Tunnel, we still depend upon. It is not a matter of tiny spiders stopping the 'march of progress'; if 'progress' ignores the spiders and the rich web of life whose presence they indicate, then it may be sowing the seeds of its own destruction.

Notes on the Spiders Recorded at Oxleas Wood

Families other than LINYPHIIDAE:

Amaurobius fenestralis. Few records; males Mar., Apr.

Amaurobius similis. Several records; males Oct., Dec., Apr.

Dictyna uncinata. Swept from bushes around edge of wood; males May, females May, Sept.

Harpactea hombergi. Several records Old Oak; males Sept., Oct., Dec.

Clubiona corticalis. Under dead bark of birches.

C. reclusa. Old Oak; male and female Sept.

C. terrestris. All sites except Pond and Hollow. Males from May-Nov., with the largest single catch at Tussock in May. A single male in Feb. 1987.

C. lutescens. Pond; female Aug.

C. compta. Coppice and swept from bushes at edge of wood; males May.

C. brevipes. Under bark; females Dec.

Zora spinimana. Old Oak; a single male May.

**Micrommata virescens*. Path; single male July.

Xysticus cristatus. Swept from vegetation at edge of wood; May.

Philodromus dispar. Swept from bushes; male May.

Philodromus sp. Path; male (palps missing) July.

**Ballus depressus*. Swept from vegetation at edge of wood; May.

Pardosa pullata. Old Oak; a single female Aug.

P. lugubris. Adults from May to early July only May and June.

Trochosa terricola. Coppice; two females May.

Pisaura mirabilis. Swept from vegetation at edge of wood; May.

Tegenaria sylvestris. Old Oak and Oak; males Apr., Sept.

Coelotes terrestris. At all sites except Pond. From May to Nov. with a pronounced peak of males in Sept. and Oct. A single male in Feb.

**Hahnina montana*. Coppice; a single male Sept.

†*H. helveola*. Mostly in the winter months with a peak of males in Dec.-Jan.

Ero furcata. Several records; males May and Oct.

†*Anelosimus vittatus*. Bramble; a single female June.

†*Theridion mystaceum*. Oak; a single female June.

T. bimaculatum. Swept from vegetation at edge of the wood; May.

T. pallens. Common in vegetation at edge of wood; males and females May.

Enoplognatha ovata. Bramble; female July, male Aug.

†*E. thoracica*. Coppice; a single male May.

Robertus lividus. Several records; males May-Aug.

†*Pholcomma gibbum*. A few records incl. Pond; male Mar.

Tetragnatha ?extensa. Swept from vegetation at edge of wood; May.

Pachygnatha clercki. Several records, Coppice and Pond; males Apr., June, Sept.

P. degeeri. Pond; a single male Aug.

Metellina segmentata. Pond, Coppice and swept from vegetation in numbers; males May, Sept.

M. mengei. Several records; males May and Oct.

Araneus diadematus. In vegetation; Sept.

Araniella cucurbitina. Swept from vegetation at edge of the wood; May.

LINYPHIIDAE

Walckenaeria acuminata. Taken at all sites, and with relatively little variation in numbers throughout the period. Males in several months with a peak in Dec.-Jan. and a minor peak in Oct. The peak of females is in July. These results are similar to those reported by Merrett (1969), but he reported the peak of females from Feb.-Apr.

W. furcillata. Coppice; males June and July.

Dicymbium sp. prob. *brevisetosum*. Old Oak; a single female July.

Gnathonarium dentatum. Several records, Pond; males Dec., Mar.

Gongylidium rufipes. Several records, males all May except single male in Sept.

Dismodicus bifrons. Old Oak; a single female July.

Maso sundevalli. Several records; males May-July.

†*Pocadicnemis pumila* (s.s) Coppice; male and female July.

Oedothorax gibbosus. Old Oak. Apparently a pioneer. A single catch of 16 (one male) in July.

Oe. tuberosus. Old Oak; a single male July.

Oe. agrestis. Path; a single male July.

Oe. retusus. Pond; a single male May.

Monocephalus fuscipes. Several records; males Apr., May, and a single male Nov.

Gongylidiehum vivum. Several records Pond; males Dec., Feb., Mar., Apr.

Micrargus herbigradus. All records (except a single male at Old Oak) from Pond site. Males May to Nov. with a peak in June.

Savignya frontata. Bramble; a single female Nov.

Diplocephalus cristatus. Oak; a single female June.

D. permixtus. Pond; female Feb., male Mar.

D. latifrons. Several records; males Dec., Apr., May.

D. picinus. From all sites. All records May-July with a peak of males in late May and of females in June.

Milleriana inerrans. Swept from vegetation at edge of wood; a single male May.

Erigone atra. Swept from vegetation; a single male May.

**Wichlea calcarifera*. Oak and Path; three males Mar.

Porrhomma pygmaeum. Pond; several records; single male May.

Meioneta rurestris. Several records Bramble and Path; males Aug.

M. beata. Path; males Dec. and July.

Microneta viaria. Taken at all sites with a pronounced peak in late Apr.-early May. 65% of the pitfall catch was trapped in a single period 20/4-9/5 and of this catch 95% were males. Three males were also trapped in Feb. and Mar. This is very similar to the phenology reported by Merrett (1969).

Centromerus sylvaticus. December records from Pond, Hollow and Bramble, all males.

C. dilutus. Taken at all sites, (only one at Pond). Males only from Dec. to Feb. with a peak in Dec. Females Mar. to Apr. and also in June-July.

Centromerita bicolor. Oak; a single female Dec.

†*Sinutula cornigera*. Coppice and Pond; males Apr., May.

Saarioa abnormis. Hollow; a single male July, Shepherdleas; a single female in December.

Macrargus rufus. Taken at all sites, through most months. A peak of males in Feb. (also noted in Feb. 1987), and a lower peak of females from Feb. to Apr.

Bathyphanes approximatus. Old oak; two females July.

- B. gracilis*. Most records from Pond site. A minor peak of females in July, and a larger peak of males in Sept.-Oct.
- B. parvulus*. Pond; a single male Sept.
- Diplostyla concolor*. Records from four sites; males in May, July and Aug.
- Leptyphantes minutus*. Old Oak and Oak; males and females Dec., Jan.
- L. tenuis*. Several records; males in all seasons.
- L. zimmermanni*. The commonest species in the Wood and from July to Sept. the most abundant species to be found. At other times of year it is not the commonest single species. Records from all months with peaks of both males and females in July and Sept.
- L. cristatus*. Several summer records; no males.
- †*L. mengei*. Coppice and Path; male and female July.
- L. flavipes*. Taken at all sites, and in all months. Males in most months from May to Mar. with peaks in June and Nov.
- †*L. tenebricola*. Several records May-Sept.; males May-July.
- L. ericaeus*. Several records, males all seasons.
- †*L. pallidus*. Several records, no males.
- Helophora insignis*. Records from Nov. to Apr. from all sites except Pond. No clear peak of males but female numbers substantial in Dec. and Feb. to Apr. Taking the winter season as being Jan. to Mar. Table 3B shows that *H. insignis* makes up 9.4% of the total catch.
- Linyphia triangularis*. Pond; a male in May.
- L. hortensis*. Several records; males May.
- L. montana*. A few records; male Apr.
- L. clathrata*. Taken from most sites, most commonly from Pond. Records from Apr. to Aug. with possible minor peaks in Apr. and June.
- L. peltata*. A few records May incl. males.
- * = Oxleas Wood records are the only ones for this species in the County of London.
- † = previously reported in *L.N.* 66 (Milner 1987a).

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Plant Galls and the London Natural History Society, Including a Catalogue of the Society's Collection at the Passmore Edwards Museum

by MELANIE J. HOLLINS and COLIN W. PLANT*

PART 1

Introduction

The History of the Plant Gall Section

In order to appreciate fully the introduction of cecidology into the activities of the London Natural History Society, it is necessary to be aware of a little of the history of the Society itself. The present day organisation was formed in 1914, by an amalgamation of two other bodies. The first of these was the North London Natural History Society, embracing a wide range of interests within the natural sciences, itself formed in 1892 from another group – the Grocer's Company's School Natural Science Club. The second was the City of London Entomological and Natural History Society, established in 1858, which, despite its title, remained largely as specialist in its interests as the Haggerston Entomological Club from which it had been formed.

Fuller accounts of the histories of these bodies, as well as of their coming together to form the L.N.H.S. can be read in Payne (1948, 1949), Castell (1958), Tremayne (1948) and Collenette (1958). Upon the amalgamation in 1914, the present Society's first President, Louis Beethoven Prout (1864-1943), was faced with a problem. Whilst he was himself an entomologist (indeed he was the acknowledged world-authority on geometrid moths) the new society encompassed a wider range of disciplines and it was Prout who extended the series of 'Research Committees', originally established in 1904, to cover each of these. It was by such a Research Committee, established in 1916, that plant galls were first studied within the L.N.H.S. It seems, however, that these Research Committees were not universally acceptable. Tremayne (1948) considered them to be 'semi-private', and tells us that due largely to the efforts of Edmund Browne Bishop (1864-1947), who was President of the combined research committee in 1915 and later, in 1921, a President of the Society, they were reformed into the present day 'Sections'.

This reorganisation of the society had taken place at a time when there was a great upsurge in interest in the study of plant galls, both at home and abroad. Edward T. Connold's *British Vegetable Galls* had first appeared in 1901, and rapidly became a standard work of reference. This was followed in 1908 by *British Oak Galls* and in 1909 by *Plant Galls of Great Britain*, both from the same author. Around the same period, the first volume of C. Houard's *Les Zooecidies des Plantes d'Europe et du Bassin de la Méditerranée* had appeared in France, and in 1912, E. W. Swanton's *British Plant Galls* was published. There is to this day possibly no greater stimulus to such interest than the availability of good works of reference and, against this background, the report of the L.N.H.S. Council for 1915 (*Transactions* pp. 20-21) notes that 'There is a good prospect of a Research Committee being formed to study plant galls, in the coming year.' The fact this event did indeed occur in 1916 was largely due to the efforts of Harold John Burkill (1871-1956). A native of Leeds, he had progressed via Cheltenham College and Cambridge University to London, where he became a medical student at St Mary's Hospital, Paddington. For health reasons he had to abandon this career, but he remained in London, becoming a member of the Stock

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Exchange and taking up residence in Kew. His interest in galls had certainly developed by 1901, for his diaries reveal that he found Connold's publication of that year 'disappointing', containing 'little botany, practically no entomology'. Burkill joined the L.N.H.S. in 1915, and soon became actively involved in the Society's scientific work. Council's report for 1916 (*Transactions* p. 22) states 'A Plant Gall Committee has been formed, and through the efforts of some enthusiastic members a good start has been made. Mr Burkill, who is Secretary, has had much work thrown on him in identifying galls that other members have collected.' The Research Board's Annual Report for the same year (*Transactions* p. 23) also records the event, adding that the Committee '...should offer special opportunities for original research to young members who have not decided in which department of natural history they shall specialise'.

The usefulness of the new Research Committee was soon realised and, in keeping with Bishop's reformation, it became the Plant Gall Section of the Society in 1918. Burkill and Bishop were joined in their endeavours at this stage by a third member, Lawrence John Tremayne (1873-1959). A solicitor in practice at Charing Cross, Tremayne had been a member of the original Grocer's Company's School Science Club since 1888, and had always had an active interest in plant galls. His precise role in the activities of the Section seems to be lost in history; certainly he was its Chairman at some point, but we have been unable to trace the years involved. A further confusion also occurs in that although Burkill was reportedly the first Secretary of the Section (Council Report for 1916) the first two annual reports published in the *Transactions* (for 1917 and 1918) were authorised by Leslie Beeching Hall. Hall was a botanist who had joined the Society in 1896, but by 1924 he had retired to Dorset from where he continued to contribute notes and records to the Society. Though the two annual reports bear his name at their foot, this was not accompanied by any title; it is possible that he was simply 'holding the fort', since the report for 1917 states that 'Owing to war conditions the work of this section has been of necessity limited...'. Certainly he does not appear to have played any major part in the Section's affairs, though on 6 May 1919 he read a paper entitled 'Oak Galls' to the Society. The annual report in the *Transactions* for 1919 was authored anonymously, but the following year, and each year thereafter until 1949 (for 1948) the reports were authored by Burkill variously as Hon. Secretary, Recorder, or both.

In 1924 Bishop retired to Godalming in Surrey, whilst Tremayne appears to have become more actively involved in the Archaeology Section (the formation of which in 1917 was largely his doing) and the Ramblers' Section, which was formed by him in 1925. In the work of the Plant Gall Section Burkill was now joined by two others. The first of these was Joseph Ross (1873-1962), who had joined the North London Natural History Society in 1910 as a life member. A Scot by birth, Ross took up residence at Chingford, Essex, and was best known as a mycologist with a particular interest in the Mycetozoa. Soon after retirement from his business in the early 1930s he became the Curator of the Epping Forest Museum at the Queen Elizabeth's Hunting Lodge, Chingford, a post he held until asking to be relieved on health grounds in 1948. It was to this museum that his extensive collections of gall flies, bryophytes and Mycetozoa were donated. He was the Chairman of the Plant Gall Section from 1928 to 1946. The following year, the chair was taken over by Montague Niblett (1878-1967). Niblett was an undoubted expert on plant galls, and had an international reputation for his experimental work on the alternation of generations in the gall-causing Cynipidae. He joined the L.N.H.S. in 1926 and together with Burkill and Ross ran the Plant Gall Section until its incorporation into the Entomology Section in 1949.

Publications on Plant Galls

Even before the formation of the Plant Gall Research Committee, Burkill had published a major contribution to the literature in the form of his 'Additions to

the list of British plant galls', which appeared in the January 1916 issue of *The Entomologist* (Burkill 1916). The birth of the L.N.H.S. Plant Gall Section gave him, and others, a vehicle for the publication of records of noteworthy galls, particularly species apparently new to Britain, in the form of *The London Naturalist*. Regular reports were published from 1918 to 1949 (covering the years 1917 to 1948) the first two by Hall, the remainder by Burkill, covering not just the London area, but the entire country. The publication of records on this scale ceased with the incorporation of the Section into the Entomology Section in 1949, though Niblett continued with a series of papers on Plant Galls in Surrey from 1951 to 1954 (covering records made from 1950 to 1953). *The London Naturalist* also served to carry several other papers on galls and their causers, particularly notable amongst which were 'The gall wasps of the London Area' in 1958 and a year later 'The gall mites (Eriophyidae) of the London Area', both penned by Niblett. A full bibliography of papers and notes in both the *Transactions of the London Natural History Society* and *The London Naturalist* is presented as Appendix 1 to this paper.

The Society's Collections

The source of the present collection is not entirely clear. Our attempts to link specimens with records previously published in *The London Naturalist* have largely proven fruitless, and the inevitable question arises over the current whereabouts of material referred to in those reports. The provenances of the specimens cover a wide geographical area of Britain, with occasional sheets from continental Europe, whilst the time span involved extends from 1908 to 1949. Most of the labels on the sheets, apart from those prepared by us from specimens still in the newspaper used in the plant press, appear to have been hand-written by H. J. Burkill and it seems possible that the collection may largely have resulted from his own endeavours. Certainly his material passed to the Society after his death in 1956. His obituary (Ross and Parmenter 1957) states '...his memory will be sustained by the collection of galls, insects and books given to the Society by his sister.' As to the other prominent London cecidologists, Joseph Ross left all his collection to the Epping Forest Museum at Queen Elizabeth's Hunting Lodge, Chingford, where he had been Honorary Curator, and this comprises (apart from bryophytes and Mycetozoa) several thousand pinned and card-mounted gall insects, but no galls. Niblett donated his bred specimens of Cecidomyiidae to the British Museum (Natural History) a few years before his death and we have been unable to locate any further Niblett material. Bishop, who died in 1947, bequeathed his books, lantern slides and general botanical herbarium to the Society. Possibly some of the latter may have contained galls. Another prominent naturalist of the period, Bernard T. Ward, who was a Committee Member of the Plant Gall Section in its latter years, bequeathed a large herbarium to the Epping Forest Conservation Centre, who have since donated this to the Passmore Edwards Museum; it contains no gall material.

Equally unclear is the precise trail of events which culminated in the arrival of the present collection at the Passmore Edwards Museum in 1986.

Following the loss to the Society of the Eccleston Square premises in 1961, attempts were made to find an alternative room in which to make the collections accessible to the members. Approaches were made to several industrial firms and to the London County Council, the Nature Conservancy and the Council for Nature, but in spite of these efforts and some publicity in the press, on radio and television no alternative was found. However, through the timely aid of the Honorary President, Professor H. Munro Fox F.R.S., arrangements were made to store the library and collections at Queen Mary College, Mile End, and this move took place in 1961 (Council Report for 1961). This was only ever intended as a temporary measure, however, and the *Report of the Society for 1962* (Lond. Nat. 42: 3) states 'Unfortunately, we were unable to find a home for our

collections and some parts of these have had to be disposed of. As the office of Curator has therefore lapsed, Mr B. L. Sage has undertaken to compile, and keep up to date, a record of the whereabouts of the items in the society's collections which are still in our possession'. As far as we are aware, this list never appeared in print. A year later, in the Report of the Society for 1963 (*Lond. Nat.* 43: 9) some brief and largely unhelpful notes on the whereabouts of parts of the collections *not* still in 'our' possession are given. Amongst these notes it was recorded under the heading *Entomology* that 'The entomological collections have all passed into other hands, but through the kindness of the Croydon Natural History Society our largest cabinet is in store and can be recovered if we should need it. Many of the specimens went into the Queen Mary College collections, and through Dr Carthy, Department of Entomology, Queen Mary College, Mile End Road, E1 access may be granted to members.' The large 'Croydon cabinet' was offered back to the Society in 1987! We have as yet been unable to locate the other material. Since the L.N.H.S. Plant Gall Section was incorporated into the Entomology Section in 1949, it is possible that any specimens of galls present went to Queen Mary College. However, we are informed by Keith Hyatt that no gall material was present in the Society's collections at Eccleston Square in 1960 when he was Curator and so this seems most unlikely: certainly there is none at the college today. All of our researches would now seem to indicate that Burkill's material had been kept by a friend, possibly Niblett, on behalf of the Society. Whatever the case, and in the absence of any documentation, we shall probably never know. The collection eventually ended up in the possession of Armand Eugene Le Gros (1908-1976) who joined the Society in 1946 and soon became involved on the Entomology Section Committee. Le Gros certainly knew Burkill, for his own note-books tell us that on the very first field trip which he led for the L.N.H.S. (to Eynsford on 2 May 1948) 'only Burkill turned up.'! Upon the death of Le Gros, his cousin, Mr Bournat, donated all of his natural history material and notes to the L.N.H.S. These were collected from his house by Keith Hyatt and amongst them were the present sheets.

Current Storage and Access

The L.N.H.S. collection of plant galls comprises specimens glued, taped or stitched with cotton to paper or card. These are stored flat in several 'box-files' and have been kept separate from other gall material. They are presently housed in the Natural Sciences Store at Plaistow, London E13. Here they may be accessed by *bona fide* researchers by appointment with C.W.P.

PART 2

A Catalogue of the London Natural History Society Collection of Plant Galls at the Passmore Edwards Museum

This catalogue is arranged in accordance with the taxonomy of the gall-causing agents. Amongst the non-insect galls we have, in general, found it convenient to retain the name of the gall causer noted on the sheet, rather than to update the taxonomy. This is particularly the case amongst the eriophyid mites, whose taxonomy is in a state of dis-array. Many species of eriophyids were originally named after the host plant on which they were first described, and of these, many, if not most, have still to be critically reviewed; it is quite possible that some of these will gall different and often un-related plant species, causing either similar or dissimilar galls, and that there will be a degree of taxonomic 'lumping' in the future. Amongst the insect species, however, we have updated the nomenclature to conform with that given in Kloet and Hincks (1964 for Homoptera, 1976 for Diptera, 1977 for Coleoptera and 1978 for Hymenoptera) and Bradley and

Fletcher (1979) for Lepidoptera. In all cases where we have updated the name of a gall-causing species, however, we have followed this by the name which appears on the sheet placed in parentheses.

Under each of these species headings we have arranged the plants which bear galls caused by that particular agent in accordance with the sequence of Clapham, Tutin and Warburg (1981). Nomenclature of the host-plants also follows these authors and for clarity, therefore, we have omitted the authorities here, other than in the case of certain species in the *Rubus fruticosus* aggregate which are not given in this reference.

There is a great deal of variation in the style of labelling on the individual sheets within the collection. In the interests of clarity therefore, we have standardised the format of entries in the catalogue. Each entry commences with the Passmore Edwards Museum Accession Number, which is itself pre-fixed with the Museum's code 'LDPEM'. There follows a very brief description of the gall written by us. Details of the locality follow, as they appear on the sheet, though in some cases we have ourselves added county names where there has been no doubt. This should be of value to researchers of local lists. The date of collection comes next and we have standardised the format here. Where known, the collector's name now appears, and is followed by the L.N.H.S. sheet number. This number will be of use to researchers since the sheets are stored by these numbers. Several of the sheets also bear a number prefixed by the letters 'L.C.'. These have been hand written on the sheets in ink by an earlier curator, and evidently stand for 'London Catalogue', by which is meant the work by Bishop, Robbins and Spooner (1928-1936) on botanical records in the London area, published in eight parts as a supplement to *The London Naturalist*. They refer to the number in that work of the host plant species affected by the gall and since that work has been superseded the L.C. number has been ignored for the purpose of the catalogue.

BACTERIA

Agrobacterium sp. On *Rosa arvensis*

LDPEM/B-0487. Round, woody growths, approximately 20mm in diameter, about the nodes, on the stems; reminiscent of witches broom on birch branches. Clandon Common, Surrey, 27 August 1932. Miss Wakefield, Kew and E. Connold? LNHS No. 322.

FUNGI

PERONOSPORALES

Albugo candida (Pers.) Kuntze (*Cystopus candidus*). On *Capsella bursa-pastoris*

LDPEM/B-0188. Swollen and distorted flowering stems. Thorpe, Derbyshire, 1908. LNHS No. 25.

TAPHRINALES

?*Taphrina potentillae* (Farlow) Johansson. On *Potentilla erecta*

LDPEM/B-0263. Distortion of leaves and stem. Probably Church Stretton. Label reads, 'No date or locality on paper but probably Church Stretton. Pressed in *Morning Post* of 30/7/30, with my name on paper.' The author is unknown. LNHS No. 103.

Protomyces macrosporus Unger. On *Oenanthie crocata*

LDPEM/B-0285. Elongate swellings on pedicels. Swanage, 1923. E. B. Bishop. LNHS No. 124.

UREDINALES

Gymnosporangium clavariiforme (Pers.) DC. On *Crataegus monogyna*

LDPEM/B-0277. Elongate swelling on the stem. Oxshott, Surrey, 1929. LNHS No. 117.

Urocystis anenomes (Pers.) Winter. On *Ranunculus repens*

LDPEM/B-0185. Small (2mm) swellings on leaves on both upper and lower surfaces. (Dr Brian Spooner has commented that this description of small swellings suggests *Entyloma microsporum* (Unger) Schroter. Thorpe, Derbyshire, 1908. H. J. Burkill. LNHS No. 22.

Urocystis violae (Sow.) F. v. Walch. On *Viola hirta*

LDPEM/B-0191. Elongate swellings on lower stems, causing stems to curve. Birling, Kent, June 1923. LNHS No. 28.

CLAVICIPITALES

Epichloe typhina (Pers.) Tul. & C. Tul. On *Holcus lanatus*

LDPEM/B-0392. Oval swelling on lower leaf surface. Dr Brian Spooner has commented that this species of fungus may not actually cause a gall. Walton Heath, Surrey, 4 September 1937. LNHS No. 231.

APHYLLOPHORALES

Exobasidium rhododendri (Fuckel) Cramer. On *Rhododendron ferrugineum*

LDPEM/B-0346. Black, almost spherical galls, up to 5mm in diameter on lower leaf surface. Tyrol, August 1925. H. Spooner. LNHS No. 183.

Exobasidium vaccinii (Fuckel) Woronin. On *Vaccinium vitis-idaea*

LDPEM/B-0343. Leaves distorted. Braemar, N.B. July 1922. LNHS No. 180.

LDPEM/B-0344. Swelling on lower surface of leaves. Bloody Beck, Harwood Dale, Yorks. September 1921. LNHS No. 181.

UNDETERMINED FUNGI

On *Juglans regia*

LDPEM/B-0476. Slightly swollen patches on lower leaf surface. (Note: this specimen has been placed here since it was clearly the opinion of the collector that a fungus was involved in causing the gall. However, the only fungus that we can trace with a similar effect is *Microstroma juglandis* (Bereng.) Sacc. which causes white patches on the lower surface of living leaves, but does not cause a gall. Possibly this specimen represents an early developmental stage of *Eriophyes erineus*?). Near Denham, Bucks. 1924. LNHS No. 311.

NEMATODA**UNIDENTIFIED EELWORMS**

On *Lapsana communis*

LDPEM/B-0329. Circular swelling on upper leaf surface. Olivers Mount, Scarborough, November 1918. LNHS No. 165.

On *Crepis vesicaria* ssp. *haenseleri*

LDPEM/B-0330. Stem twisted, distorted and swollen. Bookham, Surrey, June 1931. LNHS No. 166.

On *Leontodon hispidus*

LDPEM/B-0336. Receptacle swollen. Epsom Downs, Surrey, 3 August 1938. J. Ross. ('May be Houard 6052.') LNHS No. 173.

LDPEM/B-0337. Slight swelling on leaf midrib. Budock, Falmouth, September 1922. LNHS No. 174.

On *Pedicularis ?sylvatica*

LDPEM/B-0496. Fittleworth, October 1924. Specimen missing. LNHS No. 331.

Tylenchus devastatrix (Kühn) (?*Anguillulina dipsaci* Kühn). On *Crepis capillaris* (label *Crepis virens*)

LDPEM/B-0503. Irregular growth on stem base. Fetcham, Surrey, 1941. LNHS No. 338.

?*Anguina graminis* or *Ditylenchus graminophilus*. On *Holcus mollis*

LDPEM/B-0427. Shiny swelling and rolling of leaf margin. Peaslake, Surrey, 6 September 1937. LNHS No. 224.

?*Mycoplasma*. On *Trifolium repens*

LDPEM/B-0484. Proliferation of small leaves arising from amongst florets in flower head. Kingston Vale, Surrey, 17 August 1924. Note: this gall bears a close resemblance to the illustration T7-1 on page 70 of Stubbs (1986) which purports to be mycoplasmal. LNHS No. 319.

ARACHNIDA**ACARI**

Aceria erineae (Nal.), (*Eriophyes tristriatus* Nal. var. *erinius* Nal.). On *Juglans regia*

LDPEM/B-0459. Single large swelling in leaf between two lateral veins: black above and buff haired below. Fetcham Downs, Surrey, 15 July 1927. LNHS No. 294.

LDPEM/B-0460. Large swellings in leaf between lateral veins: black above and buff haired below. Broadstairs, East Kent, 23 July 1904. (Ex. herb. C. S. Nicholson). LNHS No. 295.

LDPEM/B-0477. Large swellings in leaf between lateral veins: black above and buff haired below. Near Reigate, Surrey, 19 July 1924. LNHS No. 312.

Aceria euaspis (Nal.) (*Eriophyes euaspis* Nal.). On *Lotus corniculatus*

LDPEM/B-0237. Leaflets swollen and covered with stout, golden hairs. Robin Hood's Bay, August 1921. LNHS No. 76.

Aceria geranii Can. On *Geranium sanguineum*

LDPEM/B-0218. Leaflets thickened, rolled and bunched into a loose 'mop-head'. Hawaby, Yorkshire, 1906. LNHS No. 55.

LDPEM/B-0219. Leaflets thickened, rolled and bunched into a loose 'mop-head'. Kynance Cove, Cornwall, 8 August 1908. C. S. Nicholson. LNHS No. 56.

On *Geranium molle*

LDPEM/B-0220. Leaflets thickened, rolled and bunched into a loose 'mop-head'. West Hyde to Denham, Bucks, 30 June 1923. LNHS No. 57.

LDPEM/B-0221. No gall apparent on this sheet. Newport, Falmouth, 1922. LNHS No. 58.

Aceria hippocastani Fockeu. On *Aesculus hippocastanum*

LDPEM/B-228. Patches of orange/brown hairs, up to 2mm, in lateral vein axils on the lower leaf surface. Norbury Park Farm, Leatherhead, Surrey, August 1927. LNHS No. 66.

LDPEM/B-0425. Patches of orange/brown hairs, up to 2mm, in lateral vein axils on lower leaf surface. Mickleham Downs, Surrey, September 1927. LNHS No. 67.

LDPEM/B-0229. Patches of orange/brown hairs, up to 2mm, in lateral vein axils on the lower leaf surface. Norbury Park Farm, Leatherhead, Surrey, 25 August 1927. LNHS No. 68.

Aceria origani (Nal.) (*Eriophyes origani* Nal.). On *Origanum vulgare*

LDPEM/B-0366. Inflorescence and tips of non-flowering shoots thickened and matted with white, felted hairs. Clandon, Surrey, 1908 and Bunster, Staffs, 1910. (Sheet annotated in 1960 with, 'considered today a subspecies (*origani*) of *E. thomasi* Nal.')

LNHS No. 203.

?*Aceria plicator* (Nal.). On *Trifolium campestre*

LDPEM/B-0233. Flowers showing elongation of petioles and proliferation of florets. Leaves with dense hairs below. Swanage, 1922. E. B. Bishop. (One specimen has been removed and a pencil note on the sheet indicates that the host was re-determined as *T. dubium* on 18 April 1934 by J. E. Lousley; this was subsequently re-mounted as sheet 73 – included below under the heading of unidentified eriophyids). LNHS No. 72.

Aceria plicator trifolii (Nal.) (*Eriophyes viciae*). On *Vicia terasperma*

LDPEM/B-0240. Shortened and swollen seed pod. (Dr Brian Spooner comments that this species does not cause pod-galls in his experience). Harton, Church Stretton, Shropshire, August 1930. H. J. Burkill. LNHS No. 79.

Aceria sanguisorbae (Can.) (*Eriophyes sanguisorbae* ssp. *minor* Can.). On *Sanguisorba minor*

LDPEM/B-0265. Leaves slightly swollen and covered with dense, golden hairs. Box Hill, Surrey, May 1922. LNHS No. 105.

Cecidophyes atrichus (Nal.). On *Stellaria graminea*

LDPEM/B-0193. Leaf blades rolled, thickened and bunched. Heronsgate, Bucks, September 1920. H. J. Burkill. LNHS No. 30.

LDPEM/B-0194. Leaf blades rolled and thickened. Kingston Vale, Surrey, August 1923. H. J. Burkill. LNHS No. 31.

LDPEM/B-0195. Leaf blades rolled and thickened. Staintondale Moor, Yorkshire, September 1921, H. J. Burkill. LNHS No. 32.

Eriophyes alpestris Nal. On *Rhododendron luteum*

LDPEM/B-0347. Terminal leaves rolled upwards, meeting at midrib. Arolla, Switzerland, 1934. Miss G. Noel. LNHS No. 184.

Eriophyes artemisiae Can. On *Artemisia vulgaris*

LDPEM/B-0323. Broadly stalked, hairy irregular growths (0.5-1.5mm) arising from upper surface of leaves. Surrey, 1915. LNHS No. 159(a).

Eriophyes avellanae Nal. On *Corylus avellana*

LDPEM/B-0453. Stems with clubbed hairs and ?buds swollen. LNHS No. 288.

Eriophyes brevitorsus Fockeu. On *Alnus glutinosa*

LDPEM/B-0449. Lower surface with an orange erineum. Arbrook Common, Surrey, 25 August 1923. LNHS No. 284.

Eriophyes campanulae (Nal.). On *Campanula glomerata*

LDPEM/B-0332. Gall on ?inflorescence. Box Hill, Surrey, September 1930. LNHS No. 169.

Eriophyes campestricola (Nal.). (*Eriophyes ulmi* Nal.). On *Ulmus procera*

LDPEM/B-0438. Pustules approximately 2mm high on upper leaf surface. These galls are in reality more reminiscent of *E. brevipunctatus*. Downs Lane, Leatherhead, Surrey, September 1927. LNHS No. 273.

as *Eriophyes cladophluthirus*. On *Solanum dulcamara*

LDPEM/B-0356. Terminal leaves and shoot grossly distorted and covered in hairs. Swanage, 1922. E. B. Bishop. LNHS No. 193.

as *Eriophyes dispar* Nal. On *Populus tremula*

LDPEM/B-0386. Leaves distorted and rolled upwards at edges. Little Bookham, 1949. LNHS No. 225.

LDPEM/B-0478. All leaves arising from a single lateral bud are stunted and distorted. Oaken Cottage, Little Bookham, Surrey, 9 June 1946. LNHS No. 313.

? *Eriophyes exilis* (Nal.) (*Aceria tiliae* Nal. var. *exilis* Nal. On *Tilia platyphyllo*

LDPEM/B-0199. Small pustules in angles of leaf veins, showing on both surfaces, the lower side being covered in buff hairs. Black Pond, Esher, Surrey, 25 August 1923. LNHS No. 36.

Eriophyes filiformis Nal. On *Ulmus glabra* ssp. *montana*

LDPEM/B-0431. Distortion of leaf surface, possibly an early stage of the gall. Leatherhead, Surrey, September 1927. LNHS No. 266.

LDPEM/B-0437. Brown scab-like thickenings on upper leaf surface, (typical gall of this species). Ashted Common, September 1927. LNHS No. 272.

Eriophyes galii Karp. On *Galium album*

LDPEM/B-0299. Leaves thickened, rolled and curved. Box Hill, Surrey, 1934. LNHS No. 138.

On *Galium mollugo*

LDPEM/B-0303. Leaves thickened, rolled and curved. Seer Green, Bucks, 8 October 1921. LNHS No. 142.

On *Galium uliginosum*

LDPEM/B-0307. Leaves thickened and rolled. Bookham Common, 13 August 1927. (with galls of *Geocrypta galii* (Dipt. Cecid.)). LNHS No. 145.

On *Galium aparine*

LDPEM/B-0309. Leaves thickened and rolled. Longford, Middlesex, 1923. LNHS No. 147.

as *Eriophyes gymnoproctus* Nal. On *Malva moschata*

LDPEM/B-0197. Leaf margins rolled upwards and thickened, and the whole terminus distorted. Three collections: Birling, Kent, 1925, (R. W. Robbins), Buckinghamshire, 1915, (L. J. Tremayne), Eynsford, Kent, 1928 (anon.). LNHS No. 34.

LDPEM/B-0198. Leaves thickened and edges rolled upwards. Less distorted than B-0257. Pidgon, Ranmore, Surrey, July, 1927. H. J. Burkill. LNHS No. 35.

Eriophyes ilicis Can. On *Quercus ilex*

LDPEM/B-0417. Lower leaf surface with patches of orange/brown hairs, particularly concentrated at leaf base, upper surface slightly puckered. Norbury Park, Surrey, February 1931. LNHS No. 257.

LDPEM/B-0420. Lower leaf surface with patches of orange/brown hairs, particularly concentrated at leaf base. Near Leatherhead, February 1922. LNHS No. 260.

Eriophyes kernerii Nal. On *Gentianella amarella*

LDPEM/B-0354. Distorted and stunted lateral shoots. White Downs, Surrey, 1929. LNHS No. 191.

LDPEM/B-0355. Lateral buds distorted, stunted and apparently unopened. Near Westcott, Surrey, September 1927. LNHS No. 192. (L.C. 1385).

? *Eriophyes lateannulatus* (*Aceria tiliae* Pagst.), On *Tilia cordata*

LDPEM/B-0214. Nail galls on upper leaf surface. Tissington, Derbyshire, 1908. LNHS No. 51.

Eriophyes lateannulatus (Label: 'two forms of *Aceria tiliae* Pagst. var. *liosoma* Nal.'). On *Tilia cordata*

LDPEM/B-0215. Nail gall on upper leaf surface with corresponding erineum below. Chepstow, 1916. H. J. Burkill. LNHS No. 52.

Eriophyes leiosoma (*Aceria tiliae* (Pagst.) var. *liosoma* Nal.). On *Tilia* × *vulgaris*

LDPEM/B-0209. Largish erinea on lower leaf surface. Monmouthshire, 1916. LNHS No. 46.

LDPEM/B-0213. Large, orange, coalescing erinea on lower surface of leaf. Some patches have a corresponding erineum on the upper surface. Kenley, Surrey, 13 June 1931. LNHS No. 50.

On *Tilia cordata*

LDPEM/B-0217. Large, coalescing erinea on lower leaf surface. Ranmore Common, Surrey, 23 June 1934. (with *Comarinia tiliarum* Kieffer, Dipt., Cecid.). LNHS No. 54.

On *Tilia platyphyllos*

LDPEM/B-0464. Discrete, pale orange erinea on lower leaf surface. LNHS No. 299.

Eriophyes macrocheilus (Nal.). (*Eriophyes macrorrhynchus* Nal.). On *Acer pseudoplatanus*

LDPEM/B-0223. Red pustules on upper leaf surface. West Humble, Surrey, 13 September 1930. LNHS No. 61.

Eriophyes macrocheilus (Nal.) (det. C. W. Plant). (*Eriophyes macrorrhynchus*).On *Acer campestre*

LDPEM/B-0227. Red tubercles, 3-4mm across on upper leaf surface, 11 August 1934. LNHS No. 65.

Eriophyes macrocheilus (Nal.). On *Acer campestre*

LDPEM/B-309. Red tubercles, 3-4mm across on upper leaf surface. Old Clock Farm, Ruislip, Middlesex, 20 September 1924. LNHS No. 309.

Eriophyes macrorrhynchus (Nal.). On *Acer pseudoplatanus*

LDPEM/B-0424. Dense, red tubercles protruding from upper leaf surface. (ex. herb. C. S. Nicholson). LNHS No. 60.

Eriophyes macrotrichus (Nal.). On *Carpinus betulus*

LDPEM/B-0452. Sinuous furrows along lateral veins. (Some leaves are also mined by larvae of *Stigmella microtherellia* (Stt.) (Lep., Nepticulidae) det. C. W. Plant). Knotty Green, Bucks, October 1921. LNHS No. 287.

Eriophyes malinus Nal. On *Malus sylvestris*

LDPEM/B-0274. Orange/brown erineum around midrib and lateral veins on lower leaf surface. All Stretton, Shropshire, 1930. LNHS No. 114.

Eriophyes mentharinus. On *Mentha* sp.

LDPEM/B-0497. Inflorescence entirely covered in dense hairs. France, 1924. L. J. Tremayne. LNHS No. 332.

Eriophyes ononidis Can. On *Ononis repens*

LDPEM/B-0232. Proliferation of buds. Swanage, Dorset, 1922. E. B. Bishop. LNHS No. 71.

Eriophyes padi Nal. On *Prunus spinosa*

LDPEM/B-0243. Pustules on upper leaf surface, with openings below. Broxa, 1909. LNHS No. 83.

On *Prunus domestica*

LDPEM/B-0247. Pustules on upper leaf surface, with openings below. Barnthorns Wood, Surrey, September 1933. LNHS No. 86.

LDPEM/B-0249. Upper leaf surface with pustules: lower surface with pale erineum along either side of midrib in basal portion of leaves. Shropshire, 6 July 1937. LNHS No. 88.

Eriophyes psilaspis Nal. On *Taxus baccata*

LDPEM/B-0387. Leaves swollen and laterally rolled from the tip. Woldingham, Surrey, 7 August 1937. LNHS No. 226.

Eriophyes pyri Pagst. On *Sorbus aria*

LDPEM/B-0267. Brownish pustules showing on both leaf surfaces and coalescing. 11 June 1932. LNHS No. 107.

LDPEM/B-0268. Pustules showing on both upper and lower surfaces of leaves. Downs Lane, Leatherhead, Surrey. 12 June 1937. LNHS No. 108.

On *Sorbus torminalis*

LDPEM/B-0269. Pustules showing on upper and lower leaf surfaces and causing localised distortion. Denham, Bucks. 1923. LNHS No. 109.

Eriophyes reclinigeri Nal. On *Crepis vesicaria* ssp. *haenselseri*

LDPEM/B-0331. Raceme with distal pedicels elongated, so that terminal flower head becomes basal to the others. Near Chalfont St Peter, Bucks, June 1930. Rev. P. H. Cooke. LNHS No. 168.

Eriophyes rudis Can. On *Betula pubescens*

LDPEM/B-0445. Swollen buds. Shropshire. 1929. LNHS No. 280.

LDPEM/B-0447. Swollen buds. No data. LNHS No. 282.

Eriophyes schmardae Nal. On *Campanula glomerata*

LDPEM/B-0332. Gall on ?inflorescence. Box Hill, Surrey, September 1930. LNHS No. 169.

Eriophyes similis Nal. On *Prunus spinosa*

LDPEM/B-0244. Pustules on lower leaf surface, opening above and hairy within. Denham, Bucks. 14 August 1920. LNHS No. 84.

On *Prunus domestica* ssp. *insititia*

LDPEM/B-0248. Pustules on lower leaf surface, opening above and hairy within. Shropshire. 1929. LNHS No. 87.

LDPEM/B-0494. Garden Hedge, Barnthorns Wood, Effingham, Surrey, 27 August 1932. LNHS No. 329.

On *Prunus domestica*

LDPEM/B-0250. Pustules on lower leaf surface, opening above and hairy within. Knockholt, Kent, June 1922. LNHS No. 89.

LDPEM/B-0495. Little Stretton. Shropshire. 1929. LNHS No. 330. Specimen missing.

Eriophyes squalidus Nal. On *Scabiosa columbaria*

LDPEM/B-0312. Leaves, buds and terminal stems swollen or distorted and with a dense, grey mat of hairs. Dovedale. 1908. LNHS No. 149.

On *Scabiosa arvensis*

LDPEM/B-0313. Terminal flower buds swollen and covered in a dense grey mat of hairs. Some leaves with a similar mat of hairs on upper surface. Fetcham, Surrey, 26 August 1937. LNHS No. 150.

Eriophyes stenaspis (Nal.). On *Fagus sylvatica*

LDPEM/B-0461. Leaf margin tightly rolled upwards especially at apex. Stoke Common, Bucks, 6 August 1924. LNHS No. 296.

Eriophyes sorbi (Nal.). (*Eriophyes surbeus*). On *Sorbus aria*

LDPEM/B-0268. Small (1-2mm) brown pustules on lower surface of leaves, with hair-like opening on upper surface. Downs Lane, Leatherhead, Surrey, 12 June 1937. LNHS No. 108.

Eriophyes tenuis Nal. On *Dactylis glomerata*

LDPEM/B-0385. Pedicels and glumes elongated to produce viviparous growth. Near Box Hill Station, Surrey, September 1933. LNHS No. 223.

LDPEM/B-0394. Pedicels and glumes elongated to produce viviparous growth. Fetcham, Surrey, 1929. LNHS No. 234.

LDPEM/B-0504. Pedicels and glumes elongated to produce viviparous growth. This gall however is at a much earlier stage of development than those described above and is

possibly not even caused by the same species. Bookham Common, Surrey, 14 July 1946. Miss Franks. LNHS No. 339.

Note: Vivipary is a normal and often common feature of *Dactylis*; we therefore have reservations about these three specimens.

Eriophyes marginatus (*Eriophyes tetanothorax*). On *Salix viminalis*

LDPÉM/B-0470. Small (1-2mm) pustules on upper leaf surface, more numerous along leaf margins. Burford Bridge, Surrey, 10 August 1946. LNHS No. 305.

LDPÉM/B-0471. Small (1-2mm) pustules on upper leaf surface, more numerous along leaf margin. Burford Bridge, Surrey, 10 August 1946. LNHS No. 306.

Eriophyes thomasi (Nal.). On *Thymus serpyllum*

LDPÉM/B-0367. Terminal leaves forming a tight, spherical cluster and covered with long white hairs. Horsley. LNHS No. 204.

Eriophyes tiliae tiliae (Pagst.) (*Aceria tiliae tiliae*). On *Tilia platyphyllos*

LDPÉM/B-0202. Nail gall on the upper surface of the leaves. Chiswick, Middlesex, June 1915. H. J. Burkill. LNHS No. 39.

Eriophyes tiliae tiliae (Pagst.). On *Tilia platyphyllos*

LDPÉM/B-0462. Nail galls on upper leaf surface. Roman Bank, 11 August 1938. LNHS No. 297.

Eriophyes tiliarins Can. On *Tilia × vulgaris*

LDPÉM/B-0207. Margin of bract rolled and distorted. With galls of *Contarinia tiliarum* Kieff. Thorpe churchyard, Surrey. LNHS No. 44.

Eriophyes tiliarius Can. On *Tilia cordata*

LDPÉM/B-0214. Possibly a rolled margin to a bract. Tissington, Derbyshire, 1908. LNHS No. 51.

?*Eriophyes triradiatus*. On *Salix fragilis*

LDPÉM/B-0465. Proliferation of stems and leaves from a single bud. Leaves are reduced and distorted. (N.B. This gall bears little resemblance to the next entry – sheet 302 – yet both are from the same general area and are labelled in identical handwriting). The description in Stubbs (1986) for *E. triradiatus* concurs with sheet 302 below and Stubbs states, 'Identity of causer not fully confirmed.' It is our opinion that the present specimen is not *E. triradiatus*. Teddington Lock, Surrey, 25 May 1946. LNHS No. 300.

Eriophyes triradiatus. On *Salix alba*

LDPÉM/B-0467. 'Witches broom' gall on inflorescence. Fields opposite Robin Hood Gate, Kingston Vale, Surrey, 25 May 1946. LNHS No. 302.

Eriophyes vermiformis Nal. On *Corylus avellana*

LDPÉM/B-0455. Buds stunted. Near Headley, Surrey, October 1933. LNHS No. 290.

Eriophyes viburni Nal. On *Viburnum lantana*

LDPÉM/B-0291. Globular (2-4mm) hairy pouches on upper leaf surface, opening on lower surface where it is surrounded by whitish hairs. Kenley, Surrey, 1932. LNHS No. 130.

LDPÉM/B-0294. Globular (2-4mm) hairy pouches on upper leaf surface, opening on lower surface where it is surrounded by whitish hairs. Clandon, Surrey, 1908; Horsley, 1922. LNHS No. 133.

Eriophyes vitalbae Can. On *Clematis vitalba*

LDPÉM/B-0183. Basal midrib and lateral veins on lower leaf surface covered with white hairs. Basal part of leaf noticeably deformed. Seer Green, Bucks, October 1921. LNHS No. 20.

Eriophyes xylosti Can. On *Lonicera periclymenum*

LDPÉM/B-0295. Leaf margin rolled upwards. Watling Street, Church Stretton, Shropshire, August 1930. LNHS No. 134.

Phyllocoptes anthobius. On *Galium uliginosum*

LDPÉM/B-0500. Abnormal growth of bracts. Bookham Common, Surrey, 12 September 1941. LNHS No. 335.

Phytoptus tetratrichus (Nal.). (*Cecidophyes tetratrichus*). On *Tilia × vulgaris*

LDPÉM/B-0211. Leaf margin thickened and rolled upwards at intervals. Kenley, Surrey. LNHS No. 48.

Phytoptus tetratrichus (Nal.) (det. prov. C. W. Plant) (*Eriophyes tiliarius* Can.).

On *Tilia cordata*

LDPEM/B-0214. Bract of flower stalk rolled upwards at centre along one edge. Tissington, Derbyshire, 1908. LNHS No. 51.

Tarsonemus spirifex Marchal. On *Elymus repens*

LDPEM/B-0390. Stalk bearing inflorescence, thickened, with dwarfed, crinkled leaves. Near Dorking, Surrey, 1933. LNHS No. 229.

?*Vasates epiphyllus*. On *Fraxinus excelsior*

LDPEM/B-0350. Lower surface with hairs along basal portion of midrib and along basal portions of lateral veins in this region. Shropshire, 1929. LNHS No. 187.

UNIDENTIFIED ERIOPHYIDS

On *Tilia platyphyllos*

LDPEM/B-0462. Eriophyid hairs in lateral vein axils on lower leaf surface. Roman Bank, 11 August 1938. (Possibly young *Eriophyes exilis*). Also, small nail galls on upper surface, possibly young *Eriophyes tiliae tiliae*. LNHS No. 297.

On *Tilia* × *vulgaris*

LDPEM/B-0463. Extreme margins of leaves rolled downwards, with orange erineum on upper surface. Church Stretton, Shropshire, May 1938. LNHS No. 298 (a and b).

LDPEM/B-0212. Shallow pouches on upper leaf surface with eriophyid hairs below. Leaf margins thickened and rolled downwards in places. Hilla Green, Brosa, 1905. LNHS No. 49.

On *Acer pseudoplatanus*

LDPEM/B-0224. 'Eriophyid mite hairs along veins and patches of ?Erineum on lamina. (This appears to us to be fungal growth – not an erineum). Shropshire, 1929. LNHS No. 62.

LDPEM/B-0225. Nail gall (2-4mm) on upper leaf with opening below. Rad Lane, Surrey, 6 September 1937. LNHS No. 63.

On *Trifolium dubium*

LDPEM/B-0234. Buds swollen and hairy. Swanage, Dorset, 1922. E. B. Bishop. (Originally included in sheet 72 as *Aceria plicator*). LNHS No. 73.

On *Ornithopus perpusillus*

LDPEM/B-0238. Shropshire, 1929. (Houard 3663). LNHS No. 77.

On *Prunus spinosa*

LDPEM/B-0246. Orange patches on leaves. 'Allfield, near Condover, Salop and elsewhere'. 3 May 1938. LNHS No. 85.

On *Sorbus aucuparia*

LDPEM/B-0266. Slight distortion of leaf surface in localised patches (1-2mm). Shropshire, 1929. LNHS No. 106.

On *Malus sylvestris*

LDPEM/B-0271. Orange/brown erineum around midrib and lateral veins on lower leaf surface. Probably *E. malinus*. Netley, Shropshire, May 1938. LNHS No. 111.

LDPEM/B-0272. Leaf margins are rolled upwards and thickened. Watling Street, N. Stretton, Shropshire, 2 May 1938. LNHS No. 112.

LDPEM/B-0273. Leaf margins are rolled upwards and thickened. Shropshire, May 1938. LNHS No. 113.

LDPEM/B-0275. Leaf margins are rolled upwards and thickened. Church Stretton and Longnor Green, Shropshire, 1930. LNHS No. 115.

On *Rumex acetosella*

LDPEM/B-0375. Distorted buds. Pennance Point, Falmouth, Cornwall, 1922. LNHS No. 213.

On *Ulmus glabra* ssp. *montana*

LDPEM/B-0434. White hairs in lateral vein axils on lower leaf surface. Norbury Park Farm, Surrey, 25 August 1927. (Houard 2063). LNHS No. 269.

LDPEM/B-0435. White hairs in lateral vein axils on lower leaf surface. Several leaves show small (0.7mm) eriophyid-type pustules on lower leaf surface which are not reported on the label. Shropshire, 1929. LNHS No. 270.

LDPEM/B-0436. White hairs in lateral vein axils on lower leaf surface. Norbury Park Farm, Surrey, 25 August 1927. LNHS No. 271.

On *Betula pendula*

The following three are almost certainly *Eriophyes rudis*.

LDPEM/B-0441. Petioles covered with orange hairs and leaves apparently stunted. Braemar, July 1923. I. H. Burkill. LNHS No. 276.

LDPEM/B-0444. Leaf distorted about the midrib on the upper surface, with orange hairs beneath. Kenley, Surrey, 13 June 1931. LNHS No. 279.

LDPEM/B-0446. Leaves distorted, bowed upwards in localised patches to form depressions, with orange erinea below. Ratlinghope, Shropshire, 5 July 1937. (Houard 1096). LNHS No. 281.

On *Betula pubescens*

LDPEM/B-0442. Small (2-4mm) white haired swellings along midrib on upper leaf surface, with a corresponding orangey erincum below. Kenley, Surrey, 13 June 1931. LNHS No. 277 (a), (b) and (c).

On *Alnus glutinosa*

LDPEM/B-0450. Lower leaf surface with eriophyid hairs arising from midrib, and from basal portions of lateral veins. Puttenham, Surrey, 14 August 1927. (Houard 1135). LNHS No. 285.

On *Corylus avellana*

LDPEM/B-0454. Leaf petioles with clubbed hairs. Surrey, 1920. (Houard 1053). LNHS No. 289.

On *Vaccinium myrtillus*

LDPEM/B-0345. Leaf margin distorted. Clova, July 1923, I. H. Burkill. LNHS No. 182.

On *Verbascum nigrum*

LDPEM/B-0359. Leaves with frilled edges. Box Hill, Surrey, 8 September, 1929. LNHS No. 196.

On *Clinopodium vulgare*

LDPEM/B-0369. Lower leaf surfaces and stems particularly pubescent. Near Dorking, Surrey, 1929. LNHS No. 206.

On *Salix fragilis*

LDPEM/B-0466. Leaf margins rolled upwards at intervals, the rolled portion thickened and discoloured. (Possibly *Dasineura marginemtorquens*). 'Langstone' Lower Road, Fetcham, Surrey, 26 September 1946. LNHS No. 301.

On *Origanum vulgare* var. *megastachium*

LDPEM/B-0499. Falmouth, 1922. Label reads: '?*Eriophyes*' but this is crossed through and annotated in the same handwriting with the words, 'Not galled'. LNHS No. 334.

(Label: *Aceria tiliae* (Nal.) var.) On *Tilia platyphyllo*

LDPEM/B-0200. Hairy rounded or elongate pouches on upper surface of leaves, with hair lined openings below. Roman Bank, Wenlock Edge, Shropshire. 11 August 1938, H. J. Burkill. LNHS No. 37.

LDPEM/B-0201. Hairy rounded or elongate patches on upper surface of leaves, with hair lined openings below. Roman Bank, Wenlock Edge, Shropshire. 11 August 1938. LNHS No. 38.

(Label: *Eriophyes padi* Nal.) On *Prunus padus*

LDPEM/B-0251. Nail galls (2.5mm tall) on upper leaf surface opening on lower surface. Castleton, North Yorkshire, 1922. LNHS No. 90.

The following five specimens have been placed in the unidentified list as it appears to us that apart from colour there is no difference between the two alleged species.

(Label: *Eriophyes gibbosus* Nal.) On *Rubus*

LDPEM/B-0257. Leaf blade slightly distorted on upper surface, the lower surface with patches of whitish hairs; similar patches of hairs also on stems and petioles. Littleworth Common, Esher, Surrey, 25 August 1923. LNHS No. 96.

The remaining four mite galls on *Rubus* spp. all look like *E. rubicolens* Can.

On *Rubus plicatus* Weihe. & Nees.

LDPEM/B-0261. Leaf blade slightly distorted on upper surface, the lower surface with patches of yellowish hairs (whitish at some angles) more prominent along midrib and veins. The leaves of this host species are less extensively galled than those of the previous entry (sheet 96); this could be because the galls are at an earlier stage of development, or else *R. plicatus* may not become galled to such an extent. Beast Cliff, Yorkshire, September 1921. LNHS No. 101.

On *Rubus echinatus* Lindl.

LDPEM/B-0262. Leaf blade slightly distorted on upper surface, the lower surface with patches of yellowish hairs (whitish at some angles) more prominent along midrib and veins. Littleworth Common, Surrey, 25 August 1923. LNHS No. 102.

(Label: *Eriophyes rubicolens* Can.). On *Rubus*

LDPEM/B-0258. Leaf blade slightly distorted on upper surface, the lower surface with patches of yellowish hairs (whitish at some angles) more prominent along midrib and veins. Yellowish patches also on petioles. Epping Forest, Essex, 27 September 1930. LNHS No. 97.

LDPEM/B-0259. Leaf blade slightly distorted on upper surface, the lower surface with patches of yellowish hairs (whitish at some angles) more prominent along midrib and veins. Yellowish patches also on petioles. Epping Forest, Essex, 27 September 1930. LNHS No. 98.

HOMOPTERA

PSYLLIDAE

Trichochermes walkeri (Forster). On *Rhamnus cathartica*

LDPEM/B-0222. Leaf margin thickened and rolled upwards. Dovedale, Derbyshire. LNHS No. 59.

Psylla buxi (Linnaeus). On *Buxus sempervirens*

LDPEM/B-0475. Leaves at the shoot tips crowded, concave and slightly thickened. Little Bookham, Surrey, 9 June 1946. LNHS No. 310.

Psyllopsis fraxini (Linn.). On *Fraxinus excelsior*

LDPEM/B-0351. Leaves thickened and rolled downwards; the surfaces with irregular red veining. LNHS No. 188.

APHIDIDAE

Cryptosiphium artemisiae Buckton (*Cryptosiphium artemisiae* Pars.). On *Artemisia vulgaris*

LDPEM/B-0322. (1) Individual leaves swollen and bent downwards. Chiswick, Middlesex, 1915. (2) Terminal leaves bunched together. Tilbury, Essex, 1921. R. W. Robbins. LNHS No. 159.

?*Trioza* sp. On *Galium aparine*

LDPEM/B-0310. Terminal shoots swollen and distorted. Poyle, Middlesex, 1 May 1925. LNHS No. 148.

PEMPHIGIDAE

Prociphilus xylostei (De Geer) (*Siphocoryne xylostei* De Geer). On *Lonicera periclymenum*

LDPEM/B-0296. Corolla swollen, with adjacent parts swollen and contorted. Fyling Hall, August 1898. LNHS No. 135.

Tetraneura ulmi (Linnaeus) (*Tetraneura ulmifolia* Baker). On *Ulmus glabra* ssp. *montana*.

LDPEM/B-0430. Stalked, club-shaped gall on upper leaf surface. Staffordshire, 1913. LNHS No. 265.

Thecabius affinis (Kaltenbach) (*Pemphigus affinis* Kalt.). On *Populus nigra*

LDPEM/B-0377. Leaf folded upwards about midrib to form pouch. Church Stretton, Shropshire, 6 July 1937. LNHS No. 215.

LEPIDOPTERA

Mompha divisella (Herrich-Schäffer) (*Mompha decorella* Steph.). On *Epilobium montanum*

LDPEM/B-0283. Reddish swelling of stem just below flowering region, with branching of the stem beyond the gall. Stumps Grove, Ockham, 4 August 1934. LNHS No. 122.

UNIDENTIFIED LEPIDOPTERA

On *Beta vulgaris* ssp. *maritima*

LDPEM/B-0373. 'Stem slightly swollen by larva of a microlepidopteron.' Tilbury, Essex, October 1921. LNHS No. 210.

NON-GALLS (LEPIDOPTERA)

Mine of *Phyllonorycter cydoniella* (D. & S.). (Label: *Phyllocoptes*). On *Malus sylvestris*

LDPEM/B-0276. On lower leaf surface. Epping Forest, Essex, 27 September 1930. LNHS No. 116.

DIPTERA

CECIDOMYIIDAE

Cistiphora sonchi (Bremer) (*Cystophora sonchi* (F. Loew)). On *Sonchus asper*

LDPEM/B-0338. Circular blisters, 3-4mm in diameter, on leaf blades evident both above and below. West Horsley, Surrey, 27 August 1932. LNHS No. 175.

On *Sonchus arvensis*

LDPEM/B-0339. Circular blisters, 3-6mm in diameter, on leaf blades evident both above and below. Near Cayton, Yorkshire, 1918. LNHS No. 176.

Dasineura acrophila (Winnertz) (*Perrisia* (= *Dasineura*) *fraxini* (Kieffer)). On *Fraxinus excelsior*

LDPEM/B-0352. Leaflets swollen about midrib, and longitudinally folded upwards. (A pencil note added later on by A. E. Le Gros separates this species from examples of the other. See *Dasineura fraxini* below). Thorpe, Surrey, 1908 and 13 August 1924. LNHS No. 189.

Dasineura acrophila (Winnertz.) (*Perrisia acrophila* Winnertz). On *Fraxinus excelsior*

LDPEM/B-0479. Leaflets folded upwards and longitudinally, so resembling pea-pods. Fetcham Downs, Surrey, LNHS No. 314.

Dasineura affinis (Kieffer). On *Viola hirta*

LDPEM/B-0190. Leaf margin tightly rolled upwards. Box Hill, Surrey, 25 August 1925. H. J. Burkill. LNHS No. 27.

Dasineura cardamines (Winnertz) (*Perrisia cardaminis* (Winnertz.)). On *Cardamine pratensis*

LDPEM/B-0480. Buds unopened and petals swollen at bases. Stamens and filaments shortened and thickened. Bignor, Sussex, 28 May 1924. Mrs Wilde. LNHS No. 315.

Dasineura crataegi (Winnertz) (*Perrisia crataegi* Winn.). On *Crataegus monogyna*

LDPEM/B-0278. Terminal leaves stunted and forming a rosette. Epsom Common, Surrey, 27 August 1937. LNHS No. 118.

Dasineura epilobii (F. Löw) (*Perrisia epilobii* F. Loew). On *Epilobium angustifolium*

LDPEM/B-0280. Buds swollen and ovoid; not opening. Black Pond, Esher, Surrey, 1923. LNHS No. 119.

LDPEM/B-0281. Buds swollen and ovoid; not opening. Black Pond, Esher, Surrey, 23 August 1924. LNHS No. 120.

Dasineura fraxinea Kieffer. On *Fraxinus excelsior*

LDPEM/B-0348. Circular blister, 7-8mm in diameter, on upper leaf surface. Chipstead, Surrey and Shropshire, 1929. LNHS No. 185.

Dasineura fraxinea Kieffer (Label: cecidomyiid). On *Fraxinus excelsior*

LDPEM/B-0349. Circular blister, 7-8mm in diameter, on upper leaf surface. Shropshire 1929. LNHS No. 186.

- Dasineura fraxini* (Bremi) (*Perrisia fraxini* (Kieffer)). On *Fraxinus excelsior* LDPEM/B-0352. Swelling along leaflet midrib-furrowed on upper surface. Thorpe, Surrey, 1908 and 13 August 1924. LNHS No. 189.
LDPEM/B-0479. Leaf midrib swollen. Fetcham Downs, Surrey, 28 July 1946. LNHS No. 314.
- Dasineura galiicola* (F. Löw) (*Perrisia*). On *Galium mollugo* LDPEM/B-0301. Terminal leaves and leaves at nodes swollen and bunched. Dartmouth, Devon, 18 August 1923. LNHS No. 140.
- Dasineura glechomae* (Kieffer) (*Perrisia glechomae* Kieffer). On *Glechoma hederacea* LDPEM/B-0372. Terminal leaf bud not opening. Headley Lane, Surrey, 29 August 1925. LNHS No. 209.
- Dasineura hygrophila* (Mik) (*Perrisia hygrophila* Mik). On *Galium palustre* LDPEM/B-0306. Terminal swelling of leaves; possibly Houard 5277? Arbrook Common, Claygate, Surrey, 25 August 1923. LNHS No. 144 (a).
- Dasineura kiefferiana* (Rübsaamen) (*Perrisia kiefferiana* Rubs.). On *Epilobium angustifolium* LDPEM/B-0282. Leaf margins rolled downwards. Black Pond, Esher, Surrey, 1923. LNHS No. 121.
- Dasineura mali* (Kieffer) (*Perrisia mali* Kieff.). On *Malus sylvestris* LDPEM/B-0270. Margins of leaves thickened and rolled upwards. Shropshire, 1930. LNHS No. 110.
- Dasineura medicaginis* (Bremi) (*Dasineura ignorata*). On *Medicago lupulina* LDPEM/B-0308. Shoots deformed to form soft, hairy, ovoid swellings. Fetcham, Surrey, 7 August 1949. LNHS No. 218.
LDPEM/B-0383. Shoots deformed to form soft, hairy, ovoid swellings. Fetcham, Surrey, 1947. LNHS No. 220.
- Oligotrophus ?panteli* Kieffer. On *Juniperus communis* LDPEM/B-0388. Fusiform terminal growth resembling a large bud. [We find it difficult to distinguish this specimen from galls of *Oligotrophus juniperinus* (Linn.)]. Lake District, September 1931. J. C. Robbins. LNHS No. 227.
LDPEM/B-0389. Fusiform terminal growth resembling a large bud. [We find it difficult to distinguish this specimen from galls of *Oligotrophus juniperinus* (Linn.)]. (Houard 127). Limpsfield, Surrey, 5 December 1937. LNHS No. 228.
- Dasineura papaveris* (Winnertz). On *Papaver nudicaule* LDPEM/B-0186. Seed capsules swollen. Fetcham, Surrey, 9 August 1928. H. J. Burkill. (Believed to be first British host record). LNHS No. 23.
- Dasineura plicatrix* (H. Loew; (*Perrisia plicatrix* H. Loew). On *Rubus* sp. LDPEM/B-0256. Leaf folded and wrinkled. Littleworth Common, Esher, Surrey, 25 August 1923. LNHS No. 95.
- Dasineura pustulans* (Rübsaamen) (*Perrisia pustulans* Rubs.). On *Filipendula ulmaria* LDPEM/B-0253. Circular blisters (3-4mm in diameter) on leaf surface. Littleworth, Esher, Surrey, September 1924. LNHS No. 92.
- Dasineura ranunculi* (Bremi). On *Ranunculus acris* LDPEM/B-0184. Leaflet thickened and rolled upwards to form a pouch. Uxbridge, Middlesex. 1922. Kingston Vale, Surrey, 6 July 1924. Ickenham, Middlesex, 16 August 1924. LNHS No. 21.
- Dasineura serotina* (Winnertz). On ?*Hypericum hirsutum* (Label: ?*Hyperacium perforatum*). LDPEM/B-0196. Apical leaves swollen. Hawnby, Yorkshire, 1906. H. J. Burkill. LNHS No. 33.
- Dasineura thomasiana* (Kieffer). On *Tilia × vulgaris* LDPEM/B-0208. Whole leaf rolled and distorted. Chiswick Park, Middlesex, 3 July 1924. "LTC." LNHS No. 45.

Dasineura tiliaevolvens (Rübsaamen). On *Tilia* × *vulgaris*

LDPEM/B-0206. Leaf margin rolled upwards and thickened. Pilsden Lacey, Surrey, 1931. LNHS No. 43.

LDPEM/B-0210. Braets thickened and rolled upwards at the edges, the rolled portion being hairy. Entire braet strongly curved laterally so that the galled portion lies on the concave side. Teddington, Middlesex. LNHS No. 47.

Dasineura ulmaria (Bremi) (*Perrisia ulmariae* Bremi). On *Filipendula ulmaria*

LDPEM/B-0252. Glabrous, hemispherical pustules, 1-2mm in diameter, on upper leaf surface, projecting below as a pubescent cone. Broxa, 1909 and 26 September 1924. LNHS No. 91.

LDPEM/B-0255. Glabrous, globular pustules (1-2mm) on leaf surface. Mickleham Downs, Surrey, 9 July 1924. LNHS No. 94.

Dasineura urticae (Perris) (*Perrisia urticae* Perris). On *Urtica dioica*

LDPEM/B-0439. Swellings on stem. July 1927. LNHS No. 274.

LDPEM/B-0440. Small swellings on upper stem and flowers. Long Mynd, Shropshire, 3 July 1937. LNHS No. 275 (a) (b) and (c).

Dasineura viciae (Kieffer). On *Vicia sepium*

LDPEM/B-0241. Several leaflets hypertrophied and folded upwards to form a single pod-like structure. Uxbridge, Middlesex. 1922. LNHS No. 80.

Didymomyia tiliacea (Bremi) (*Didymomyia reaumuriana* (F. Loew)). On *Tilia* × *vulgaris*

LDPEM/B-0203. Leaf surface with cup-shaped galls erupting from surface, mostly on the veins, opening on either surface – though most open above. Inner surface of cups striated, the striae running from rim to base – the whole resembling a miniature bird's nest. Monmouthshire, 1916. LNHS No. 40.

Geocrypta galii (H. Loew) (*Perrisia galii* H. Loew). On *Galium uliginosum*

LDPEM/B-0307. Swellings on upper surface, 2-3mm in diameter, coalescing to form a larger mass. Bookham Common, Leatherhead, Surrey, 13 August 1927. LNHS No. 145.

LDPEM/B-0308. Swellings on upper surface, 2-3mm in diameter, coalescing to form a larger mass. Wimbledon Common, Surrey, 1920. LNHS No. 146.

On *Galium verum*

LDPEM/B-0297. Flower stalks with globular swellings just below bud. Petersham, 6 September 1925. LNHS No. 136.

Geocrypta trachelii (Wachtl) (*Perrisia trachelii* Wachtl). On *Campanula rotundifolia*

LDPEM/B-0341. Axillary buds swollen. Dovedale, Derbyshire. 1912. LNHS No. 178.

LDPEM/B-0342. Axillary buds swollen. Clandon, Surrey. 1920. LNHS No. 179.

Jaapiella bryoniae (Bouché) (*Perrisia bryoniae* Bouché). On *Bryonia dioica*

LDPEM/B-0284. Leaf base swollen, distorted and folded. Near Hanwell, Middlesex. September 1921. LNHS No. 123.

Jaapiella veronicae (Vallot) (?*Perrisia veronicae* Vallot). On *Veronica serpyllifolia*

LDPEM/B-0365. ?Terminal leaves swollen in region of inflorescence. (Doubtful determination). Shropshire. 1929. LNHS No. 202.

Janetiella lemei (Kieffer) (*Oligotrophus lemei* Kieffer). On *Ulmus glabra* ssp. *montana*

LDPEM/B-0429. Midrib of leaf much swollen below, and from it arise numerous flask-shaped structures. Above the gall appears as a circular swelling on the leaf. Albury, Surrey, 1920. LNHS No. 264.

LDPEM/B-0432. Midrib of leaf much swollen below, and from it arise numerous flask-shaped structures. Above the gall appears as a circular swelling on the leaf. (Gall development is in a very early stage). Heronsgate, Buckinghamshire, June 1923. LNHS No. 267.

Janetiella thymi Kieffer (*Janetiella thymicola* Kieffer). On *Thymus pulegioides*

LDPEM/B-0268. Flower swollen, calyx exceeding corolla, stamens and gynoecium apparently absent. Birling, Kent, 1923. R. W. Robbins. LNHS No. 205.

Lathromyza schlechtendali (Kieffer) (*Lathromyza schlechtendali* (Kieffer)). On *Lathyrus montanus*

LDPEM/B-0242. Leaflets slightly thickened and longitudinally rolled upwards from both sides. Gerrards Cross, Buckinghamshire, 28 August 1920. LNHS No. 82.

Macrolabis pilosellae (Binnie). On *Hieracium pilosella*

LDPEM/B-0334. Leaf reduced and rolled around an atrophied shoot. Epping Forest, Essex, 27 September 1930. LNHS No. 171.

Phlyctidobia solmsi (Kieffer) (*Oligotrophus solmsii* Kieff.). On *Viburnum lantana*

LDPEM/B-0292. Circular blister galls (3-4mm diameter) on upper leaf surface. Near Farthing Down, Surrey, 1931. LNHS No. 131.

LDPEM/B-0293. Circular blister galls (3-4mm diameter) on upper leaf surface. Surrey, 1915. E. B. Bishop. LNHS No. 132.

Rhabdophaga nervorum (Kieffer). On *Salix cinerea*

LDPEM/B-0473. Distortion of leaf around midrib. Headley, Surrey, 22 October 1938. LNHS No. 308.

Rhabdophaga rosaria (H. Loew). On *Salix triandra*

LDPEM/B-0468. Terminal leaves reduced and crowded to form a rosette. Ewell, Surrey, 22 August 1941. LNHS No. 303.

Rhopalomyia millefolii (H. Loew) (*Tylenchus millefolii* F. Löw.). On *Achillea millefolium*

LDPEM/B-0316. Ovoid swellings (1-2mm diameter) on leaves. Banstead Heath, Surrey, 9 July 1938. J. Ross. LNHS No. 153.

Rhopalomyia millefolii (H. Loew). On *Achillea millefolium*

LDPEM/B-0319. Ovoid swellings (1-2mm diameter) on leaves. Thorpe Cloud, Derbyshire, August 1910. (Note: Sheet also bears an example of the gall of *Diricha guttularis* - spindle shaped fleshy swellings at the stem base). LNHS No. 156.

LDPEM/B-0376. Ovoid swellings (1-2mm diameter) on leaves. Fetcham, Surrey, 1949. LNHS No. 214.

Rhopalomyia ptarmicae (Vallot) (Not named on sheet). On *Achillea ptarmica*

LDPEM/B-0318. Flower heads swollen and bunched together. Epsom Common, Surrey, 30 August 1930. LNHS No. 155.

Zygiobia carpini (F. Löw) (*Perrisia carpini*). On *Carpinus betulus*

LDPEM/B-0451. Midrib swollen on lower leaf surface and distortion of adjacent blade. Knotty Green, Buckinghamshire, October 1921. LNHS No. 286.

Kiefferia pericarpiicola (Bremi) (*Schizomyia pimpinellae*). On *Silva silaus*

LDPEM/B-0378. Fruits swollen. Bookham, Surrey, 1949. LNHS No. 216.

Placochela nigripes (F. Löw) (*Schizomyia nigripes* F. Loew). On *Sambucus nigra*

LDPEM/B-0290. Individual flowers swollen. (This species may be an inquiline by *Comarinia lonicerearum*). Fetcham Surrey, 1931. LNHS No. 129.

Schizomyia galiorum Kieffer. On *Galium album*

LDPEM/B-0300. Fruit swollen and elongated. Ranmore, Surrey, 16 August 1930. LNHS No. 139.

On *Galium mollugo*

LDPEM/B-0304. Fruit swollen and elongated. Dartmouth, Devon, 18 August 1923. LNHS No. 143.

LDPEM/B-0305. Fruit swollen and elongated. Dartmouth, Devon, 18 August 1923. LNHS No. 144.

Lasioptera carophila (F. Löw) (*Lasioptera carophila*). On *Silva silaus*

LDPEM/B-0378. Fruit swollen. Bookham, Surrey, 1949. LNHS No. 216.

Trotteria umbelliferarum Kieffer. On *Daucus carota*

LDPEM/B-0287. Fruit swollen, brown and spherical with orange/brown hairs. (Note on sheet: 'red larvae.'). Park Downs, Chipstead, Surrey, 1929. LNHS No. 126.

Atrichosema aceris Kieffer. On *Acer campestre*

LDPEM/B-0226. Fusiform swelling on petiole and base of midrib. Church Stretton, Shropshire, August 1930. LNHS No. 64.

- LDPEM/B-0227. Fusiform swelling on petiole. 11 August 1934. LNHS No. 65.
- Contarinia helianthemii* (Hardy). On *Helianthemum nummularium*
LDPEM/B-0189. Rosette of thickened and deformed terminal leaves. Bunster, Staffordshire, 1910. LNHS No. 26.
- Contarinia loti* (De Geer). On *Lotus corniculatus*
LDPEM/B-0236. Flowers swollen and unopened. Yorkshire, 1921. LNHS No. 75.
- Contarinia melanocera* Kieffer. On *Genista tinctoria*
LDPEM/B-0203. Swollen and distorted inflorescence. Harefield, 28 June 1924. LNHS No. 69.
- Contarinia nicolayi* (Rübsaamen). On *Heracleum sphondylium*
LDPEM/B-0286. Gross distortion and diminution of umbel. Swanage, Dorset, 1923. E. B. Bishop. LNHS No. 125.
- Contarinia sambuci* (Kaltenbach) (*Contarinia lonicerearum* F. Loew). On *Sambucus nigra*
LDPEM/B-0289. Flowers swollen. Shropshire, 1929. LNHS No. 128.
- Contarinia solani* (Rübsaamen). On *Solanum dulcamara*
LDPEM/B-0357. Flowers swollen. Fetcham, Surrey, 1929. LNHS No. 194.
LDPEM/B-0358. Flowers swollen. 29 July 1933. LNHS No. 195.
- Contarinia steini* (Karsch). On *Silene maritima*
LDPEM/B-0192. Swollen flower bud. Penance Point, Falmouth, Cornwall, September 1922. LNHS No. 29.
- Contarinia tiliarum* (Kieffer). On *Tilia* × *vulgaris*
LDPEM/B-0206. Swellings on petiole. Polsden Lacey, Surrey, 1931. LNHS No. 43.
LDPEM/B-0207. Leaf margin rolled upwards. Thorpe, Derbyshire, 5 September 1913. LNHS No. 44.
- Contarinia tiliarum* (Kieffer). On *Tilia cordata*
LDPEM/B-0216. On ?fruit. Ranmore Common, Surrey, June 1934. LNHS No. 53.
LDPEM/B-0217. Bud swollen. Ranmore Common, Surrey, 23 June 1934. LNHS No. 54.
- Contarinia tragopogonis* (Kieffer). On *Tragopogon pratense*
LDPEM/B-0340. Gall not apparent. Hog's Back, Surrey, 27 June 1937. LNHS No. 177.
- Diodaulus linariae* (Winnertz) (*Contarinia linariae* Winn.). On *Linaria vulgaris*
LDPEM/B-0360. Terminal leaves distorted and bunched together. Burnham Beeches to Gerrards Cross, Buckinghamshire, 28 August 1920. LNHS No. 197.
LDPEM/B-0362. Terminal leaves distorted and bunched together. Near Uxbridge, Middlesex, 30 June 1923. LNHS No. 199.
- Loewiola centaureae* (F. Löw). On *Centaurea scabiosa*
LDPEM/B-0326. Distortion of midrib and blade of leaves. Tothill, Leatherhead, Surrey, 24 July 1937. LNHS No. 162.
LDPEM/B-0327. Distortion of midrib and blade of leaves. (A) Clandon, Surrey, 1908. (B) and (C) Harefield, Middlesex, 28 June 1924. LNHS No. 163.
LDPEM/B-0328. Distortion of midrib and blade of leaves. Surrey, 1925. LNHS No. 164.
- Macrodiplosis dryobia* (F. Löw). On *Quercus robur*
LDPEM/B-0415. Lobes of leaves folded downwards. Shropshire, 1929. LNHS No. 255.
- Macrodiplosis volvens* Kieffer. On *Quercus petraea*
LDPEM/B-0413. Leaf margins rolled upwards and swollen between nodes. Castleton, North Yorkshire, September 1922. LNHS No. 253.
- Putoniella pruni* (Kaltenbach) (*Putoniella marsupialis* (F. Löw)). On *Prunus spinosa*
LDPEM/B-0245. Leaves thickened along midrib to form a reddish 'pouch' on the lower surface. Banks Common, Surrey, 1929. LNHS No. 84(a).
LDPEM/B-0493. Leaves thickened along midrib to form a 'pouch' on the lower surface. Ham Common, Surrey, 25 June 1946. LNHS No. 328.

UNIDENTIFIED CECIDOMYIIDAE

On *Papaver nudicaule*

LDPEM/B-0187. Stamens aborted. Fetcham, Surrey, 1930. LNHS No. 24.

On *Tilia* × *vulgaris*

LDPEM/B-0205. Swollen flower buds. Watling Street, Shropshire, 1937. LNHS No. 42.

On *Onobrychis viciifolia*

LDPEM/B-0239. Leaves swollen, folded upwards at midrib and longitudinally decurved to form a pouch containing the larvae. Downs above Bookham, Surrey, 1927. LNHS No. 78.

On *Filipendula vulgaris*

LDPEM/B-0254. No gall apparent: label reads, 'Perrisia-red larvae in buds.' Albury Downs, Surrey, 1931. LNHS No. 93.

On *Cornus sanguinea*

LDPEM/B-0288. Flower buds enlarged. Fetcham, Surrey, June 1931. LNHS No. 127.

On *Ulmus glabra* ssp. *montana*

LDPEM/B-0433. Circular blisters (4-6mm in diameter) on leaf blades, evident on both surfaces and with exit hole on lower surface. Shropshire, 1929. LNHS No. 268.

On *Betula pubescens*

LDPEM/B-0443. Circular blisters (3-4mm in diameter) on leaf blade, evident on both upper and lower surfaces. Possibly *Anisostephus betulinum* (Kieffer). Black Pond, Esher, Surrey. LNHS No. 278.

LDPEM/B-0448. Circular blisters (3-4mm in diameter) on leaf blade, evident on both upper and lower surfaces. Shropshire, 1929. LNHS No. 283.

On *Corylus avellana*

LDPEM/B-0456. Patches of discolouration associated with a blistering of the leaf, principally along the midrib and lateral veins. Larva occupies centre of the blister, causing a slight swelling. Headley, Surrey, 26 September 1931. LNHS No. 291.

LDPEM/B-0457. Circular blisters (3-4mm in diameter) on leaf blade, evident on both upper and lower surfaces. Abbey Wood, Kent, 5 September 1931. LNHS No. 292.

LDPEM/B-0458. Circular blisters (3-4mm in diameter) on leaf blade, evident on both upper and lower surfaces, causing a 'puckering' of the leaf. Shropshire. 1929. LNHS No. 293.

On *Quercus petraea* and *Quercus robur*

LDPEM/B-0399. Spherical gall on upper leaf surface, with some deformation of the leaf blade evident. Shropshire. 1929. LNHS No. 239.

On *Quercus robur*

LDPEM/B-0404. Circular (2-4mm) blister-like swellings on leaf. Shropshire, 1929.

On *Quercus ilex*

LDPEM/B-0418. ?Small leaves particularly pubescent. Tramps Green, Virginia Water, Surrey, 26 July 1924. LNHS No. 258.

On *Quercus cerris*

LDPEM/B-0421. Young leaves apparently stunted. (Label reads: 'white cecid larvac'). Rammore Common, Surrey, 27 June 1931. LNHS No. 261.

On *Gentianella amarella*

LDPEM/B-0353. Localised swelling on stem. White Downs, Surrey. 1929. LNHS No. 190.

On *Lycopus europaeus*

LDPEM/B-0498. Circular blisters, 2-3mm in diameter, on leaves. Arbrook Common, Surrey, 7 September 1946. M. Niblett. LNHS No. 333.

On *Galium mollugo*

LDPEM/B-0302. Stem slightly swollen and strongly curved. (Label: 'Halls Gall'). (Note: this resembles a *Puccinia* sp., possibly *P. galii-veri*, rather than a cecidomyid fly). Dartmouth, Devon, 18 August 1923. LNHS No. 141.

On *Galium aparine*

LDPEM/B-0311. Upper stem shortened causing a clustering of upper leaves. Shropshire, 1929. (?Houard 5307). LNHS No. 148(a).

On *Solidago virgaurea*

LDPEM/B-0314. Flower buds swollen. Penryn, September 1922. LNHS No. 151.

On *Erigeron acre*

LDPEM/B-0315. Axillary buds distorted and covered with white hairs. Epsom, Surrey, 18 August 1934. Headley, Surrey, 30 September 1933. LNHS No. 152.

On *Artemisia absinthium*

LDPEM/B-0321. Upper stem swollen and leaves bunched. Near river, Abbey Wood, Kent, 5 September 1931. (A note on this sheet reads, 'Specimens were sent to H. [?] F. Barnes who replied months after, see his letter.' The whereabouts of this letter is unknown). LNHS No. 158.

On *Sonchus oleraceus*

LDPEM/B-0502. Junction of root and stem swollen and basal leaves distorted in this region. Fetcham, Surrey, 3 April 1931. LNHS No. 337.

(Label *Dasineura viciicola* Tavares) [We are unable to locate this name in Kloet and Hincks (1975)]. On *Vicia sativa* ssp. *nigra*

LDPEM/B-0279. Individual leaflets much swollen, especially at their bases, and longitudinally rolled upwards to resemble seed pods. Hascombe, Surrey, August 1927. LNHS No. 81.

(Label: *Asphondylia* sp.). On *Scrophularia nodosa*

LDPEM/B-0363. On leaves. Mulgrave Woods, Yorkshire, October 1937. H. Britten. LNHS No. 200.

(Label: *Contarinia* sp. indet.). On *Diplotaxis muralis*

LDPEM/B-0481. Swollen flower. D.C. Fetcham, Surrey, 17 August 1941. LNHS No. 316.

(Label: *Spathogaster (Neuroterus) vesicator* Schl.). On *Quercus robur*

LDPEM/B-0402. Circular (3-4mm) blister-like swellings on leaf. Four specimens. 'Broxa', 1909, two specimens. Weybridge, Surrey, 1908. LNHS No. 242. (This gall appears to us to be dipterous).

TEPHRITIDAE

Oxyna flavipennis (H. Loew). On *Achillea millefolium*

LDPEM/B-0317. Swelling at base of stem. Fetcham, Surrey, 8 September 1937. LNHS No. 154.

Oxyna proboscidea (H. Loew) (*Teplritis proboscidea* H. Loew). On *Chrysanthemum leucanthemum*

LDPEM/B-0320. Swelling on main root stem. Harefield, 1923. LNHS No. 157.

Sphenella marginata (Fallén). On *Senecio vulgaris*

LDPEM/B-0324. Gall not apparent. West Horsley, 27 August 1932. LNHS No. 160.

CHLOROPIDAE

Anthracoaphaga stigula (Fabricius) (*Chlorops cingulata* Meig.). On *Brachypodium sylvaticum*

LDPEM/B-0393. Side shoot reduced to fusiform swelling; leaves much shortened to give appearance of bracts. Near Gomshall, November 1933. LNHS No. 233.

Chlorops pumilionis (Bjerkander) (*Chlorops taeniopus* (Meigen)). On *Elymus repens*

LDPEM/B-0384. Distal node thickened and terminal shoot which arises therefrom is 'crinkled'. Fetcham, Surrey, 16 September 1931. LNHS No. 222.

?*Chlorops taeniopus* Meigen. On *Elymus caninus*

LDPEM/B-0428. Terminus of stem reduced to a fusiform swelling; no flowering shoot is produced. Dorking, Surrey, 21 August 1934. LNHS No. 232.

SYMPHYTA

TENTHREDINIDAE

Pontania proxima (Lepeletier). On *Salix fragilis*

LDPEM/B-0466. Reddish bean-shaped galls on leaf surface. 'Langstone', Lower Road, Fetcham, Surrey, 26 September 1946. LNHS No. 301.

On *Salix triandra*

LDPEM/B-0469. Reddish bean-shaped galls on lower leaf surface. Ewell, Surrey, 22 August 1941. LNHS No. 304.

UNIDENTIFIED SAWFLY

On *Salix caprea*

LDPEM/B-0472. Mine in parenchyma of leaf. This does not appear to be a true gall. Woldingham, Surrey, 7 May 1937. LNHS No. 307.

PARASITICA

CYNIPIDAE

Phanacis hypochaeridis (Kieffer) (*Aylax* (*Aulacidea*) *hypochaeridis* Kieff.). On *Hypochaeris radicata*

LDPEM/B-0335. Flowering stems with elongate swellings: stems consequently curled or otherwise distorted. Wimbledon, Surrey, 26 July 1931. LNHS No. 172.

Aulacidea hieracii (Bouché). On *Hieracium umbellatum*

LDPEM/B-0333. Fusiform swelling of stem causing it to bend. Denham, Bucks, 14 August 1920. LNHS No. 170.

As *Aylax* sp. indet. On *Linaria vulgaris*

LDPEM/B-0361. Upper stem distorted and swollen with localised proliferation of leaves. 1915. E. B. Bishop. (Label 'Elongated swelling, multiocular. (aulax) E-N, E-C. (?Houard 5035)'). LNHS No. 198.

Isocolus scabiosae (Giraud) (*Aylax scabiosae* Giraud). On *Centaurea scabiosa*

LDPEM/B-025. Stem base greatly swollen to produce larval cells. Bookham, Surrey, 11 October 1930. LNHS No. 161.

Liposthenus latreillei (Kieffer). On *Glechoma hederacea*

LDPEM/B-0371. Hairy, globular swellings on the leaves. Church Stretton, Shropshire, August 1930. LNHS No. 208.

LDPEM/B-0307. Hairy, globular swellings on the leaves. Box Hill, Surrey, 29 August 1925. LNHS No. 207.

Xestophanes brevitorsus (Thomson). On *Potentilla erecta*

LDPEM/B-0264. Brown, nodular swelling on stem. York Moors, 1904, 1909. LNHS No. 104.

Diastrophus rubi (Bouché) (*Diastrophus rubi* Hartig). On *Rubus* sp. indet.

LDPEM/B-0260. Elongated, irregular swelling on stem showing several exit holes. Clandon Common, Surrey, 27 August 1933. LNHS No. 99.

Diplolepis eglanteriae (Hartig) (*Rhodites eglanteriae* Hartig.). On *Rosa arvensis*

LDPEM/B-0486. 'Pea-galls' on lower leaf surface. Thorpe, Surrey, 1912. LNHS No. 321.

Diplolepis mayri (Schlechtendal) (*Rhodites mayri* Schl.). On *Rosa micrantha*

LDPEM/B-0489. Robin's pin-cushion gall with unbranched filaments on stem. Eynsford, Kent, 12 July 1930. LNHS No. 324.

On *Rosa canina*

LDPEM/B-0492. Robin's pin-cushion gall with unbranched filaments on stem. 'Second British record. Found previously in the North of England by Prof. J. W. Heslop Harrison.' Shorcham, Kent, 1928. LNHS No. 327.

Diplolepis nervosa (Curtis) (*Rhodites nervosus*) *rosarum* Gir.). On *Rosa canina*

LDPEM/B-0490. 'Sputnik' or spike-pea gall. Clandon, Surrey, 1908. LNHS No. 325.

Diplolepis rosae (Linnaeus) (*Rhodoites rosae* Linn.). On *Rosa micrantha*

LDPEM/B-0489. 'Robins pin-cushion' gall with branched filaments on stem. Eynsford, Kent, 12 July 1930. LNHS No. 324.

On *Rosa canina*

LDPEM/B-0491. Robin's pin-cushion gall with branched filaments on stem. LNHS No. 326.

Diplolepis spinosissimae (Giraud) (*Rhodites spinosissimae* Giraud). On *Rosa pimpinellifolia*

LDPEM/B-0488. Swelling in leaf, evident on both surfaces, and centred on the midrib. Barnes, Surrey, 1925. LNHS No. 323.

- Neuroterus albipes* (Schenck). Agamic generation. On *Quercus petraea*
LDPEM/B-0411. Thin disc-shaped swelling on leaves. Church Stretton, Shropshire,
August 1938. LNHS No. 251.
- Neuroterus aprilius* (Giraud). Agamic generation. On *Quercus robur*
LDPEM/B-0408. Galls in buds. Epping Forest, Essex, 5 May 1937. J. Ross. LNHS
No. 248.
- Neuroterus numismalis* (Geoffroy) (*Neuroterus numismatis* Oliv.). Agamic
generation. On *Quercus robur*
LDPEM/B-0395. Button spangle galls on lower leaf surface. Queen's Wood, Middlesex,
October 1901. LNHS No. 235.
- Neuroterus numismalis* (Geoffroy) (*Neuroterus numismalis* (Olivier)). Agamic
generation. On *Quercus robur*
LDPEM/B-0397. Button spangle galls on lower leaf surface. Epping Forest, Essex,
September 1936. J. Ross. LNHS No. 237.
- Neuroterus numismalis* (Geoffroy) (*Neuroterus vesicator* Schl.). Sexual genera-
tion. On *Quercus petraea* and *Quercus robur*
LDPEM/B-0409. Blister-like swelling on the leaves, evident above and below. Shrop-
shire, 1929. LNHS No. 249.
- Neuroterus tricolor* (Hartig) (*Neuroterus fumipennis* Htg.). Agamic generation.
On *Quercus robur*
LDPEM/B-0406. Spangle galls on lower leaf surface. One leaf also has a mine of
Phyllonorycter sp. (Lepidoptera: Gracillariidae). Epping Forest, Essex, October 1933.
LNHS No. 246.
- Neuroterus tricolor* (Hartig). Agamic generation. On *Quercus petraea*
LDPEM/B-0423. Spangle galls on lower leaf surface. Friday Street, Kent, 6 August 1932.
LNHS No. 263 (a) and (b).
- Neuroterus tricolor* (Hartig). Sexual generation. On *Quercus robur*
LDPEM/B-0401. Spherical gall on lower leaf surface. Gall has hairs arising from minute
'warts' on its surface. Stanwell, Middlesex, 1920. LNHS No. 241.
- Andricus corruptrix* (Schlechtendal) (*Cynips corruptrix* Schl.). On *Quercus robur*
LDPEM/B-0405. Circular galls on lower leaf surface. Walton Heath, Surrey, 4
September 1937. (Doubtful determination C.W.P.). LNHS No. 245.
- Andricus curvator* Hartig. Sexual generation. On *Quercus petraea* and *Quercus*
robur
LDPEM/B-0416. Swelling of midrib or lateral vein causing distortion of leaf blades.
Shropshire, 1929. LNHS No. 256.
- Andricus inflator* Hartig (*Andricus globuli* (Hartig)) Agamic generation. On
Quercus robur
LDPEM/B-0398. Gall has become detached from host and is now missing. Chertsey,
Surrey, 1920. LNHS No. 238.
- Andricus ostreus* (Hartig) Agamic generation. On *Quercus robur*
LDPEM/B-0422. Swellings on midrib and veins on lower leaf surface. Westcott, 6 August
1932. LNHS No. 262.
On *Quercus petraea*
LDPEM/B-0423. Swelling on midrib and veins on lower leaf surface. Friday Street, Kent,
6 August 1932. LNHS No. 263 (b).
- Andricus quercustradicus* (Fabricius) (*Andricus trilineatus* (noduli)) Agamic
generation. On *Quercus robur* and *Quercus petraea*
LDPEM/B-0400. Oval shaped swellings on midrib and petiole. Shropshire, 1929. LNHS
No. 240.
- Andricus solitarius* (Fonscolombe) Agamic generation. On *Quercus robur*
LDPEM/B-0407. Swollen buds. 'Most of these galls are immature.' Epping Forest,
Essex, 'Various dates' 1929. J. Ross. LNHS No. 247.
- Andricus solitarius* (Fonscolombe) (*Andricus occultus* Tschek.) Sexual genera-
tion. On (A) *Quercus petraea* and (B) *Quercus robur*
LDPEM/B-0410. On inflorescence. (A) Abbey Wood, Kent, 30 May 1936, 6 May 1937.

(B) Horsley, Surrey, 24 April 1937 and Epping Forest, Essex, 26 May 1937. J. Ross. LNHS No. 250.

Andricus solitarius (Fonscolombe). Agamic generation. On *Quercus petraea* LDPEM/B-0414. Swollen bud. Shropshire, 1929. LNHS No. 254.

Andricus testaceipes Hartig. Sexual generation. On *Quercus petraea* LDPEM/B-0412. Leaf with oval swelling on midrib. Castleton, North Yorkshire, 1922. LNHS No. 252.

On *Quercus cerris*

LDPEM/B-0419. Leaf with oval swelling on midrib. Claygate, Surrey, September 1922. LNHS No. 259.

Trigonaspis megaptera (Panzer) ((*Biorrhiza*) *Trigonaspis renum* Giraud). On *Quercus robur*

LDPEM/B-0396. Kidney-shaped swellings on lower leaf surface. Epping Forest, Essex, November 1936. J. Ross. LNHS No. 236.

Trigonaspis megaptera (Panzer) (*Trigonaspis unum*). Agamic generation. On *Quercus robur*

LDPEM/B-0403. Kidney-shaped swellings on lower leaf surface. Bookham, Surrey, 3 October 1920. J. Ross. LNHS No. 243.

EURYTOMIDAE

Tetramesa hyalinipennis (Walker) (*Isosoma graminicola*). On *Elymus repens* LDPEM/B-0390. Elongate swellings on stems, incorporating several leaf sheaths. Near Dorking, Surrey, 1933. LNHS No. 229.

Tetramesa calamagrostidis (von Schlechtendal) (?*Isosoma calamagrostidis*). On *Calamagrostis epigejos*

LDPEM/B-0382. Irregular swelling of internode on stem; stem is also distorted in the flowering region. Label reads: 'Received 22 October 1945 from A. A. Dallman of Doncaster.' LNHS No. 221.

Tetramesa hyalinipennis (Walker) (*Isosoma graminicola* Giraud). On *Elymus pycnanthus*

LDPEM/B-0391. Fusiform swelling on stem; upper inflorescence also appears to be similarly galled. Tilbury, Essex and Purfleet, Essex, October 1921. LNHS No. 230.

UNIDENTIFIED EURYTOMIDAE

Tetramesa sp. (*Isosoma* sp. indet.). On *Lolium perenne*

LDPEM/B-0381. Swollen stem and leaf bases. Bockett's Farm, Fetcham, Surrey, 26 December 1942. LNHS No. 219.

COLEOPTERA

?*Apion frumentarium* (Linnaeus) (*nec* Paykull, 1792 = error). On *Rumex acetosella*

LDPEM/B-0374. Leaf midrib, swollen. (Note: other species of weevil cause similar galls, and the present determination can not be confirmed since adults do not appear to have been bred out). Denham, Bucks, 14 August 1920. LNHS No. 212.

Apion loti Kirby. On *Lotus corniculatus*

LDPEM/B-0235. Swollen pod. Walton Heath, Surrey, 24 July 1937. (Three of the weevils shown). LNHS No. 74.

Apion scutellare Kirby. On *Ulex minor*

LDPEM/B-0231. Longitudinally ribbed swelling on stem. Limpsfield, Surrey, 5 September 1937. J. E. S. Dallas. LNHS No. 70.

Apion scutellare Kirby. On *Ulex minor*

LDPEM/B-0426. Longitudinally ribbed swellings on stems. Bookham Common, Surrey, 1948. LNHS No. 217.

?*Ceuthorrhynchus pleurostigma* (Marsham). On *Diplotaxis muralis*

LDPEM/B-0482. Swelling on root. Fetcham, Surrey, 17 August 1941. LNHS No. 317.

UNIDENTIFIED BEETLES

On *Gentianella amarella*

LDPEM/B-0353. Stem swollen at junction with tap roots. White Downs, Surrey, 1929. LNHS No. 190.

On *Diplotaxis muralis*

LDPEM/B-0379. Tap root swollen just below ground surface. Fetcham, Surrey, 5 June 1949. LNHS No. 217 (a).

LDPEM/B-0483. Stem base swollen at junction with tap root. Fetcham, Surrey, 1946. LNHS No. 318.

On *Achillea millefolium*

LDPEM/B-0501. Globular swelling on root. Fetcham, Surrey, 29 March 1931. LNHS No. 336.

UNKNOWN CAUSERS

On *Digitalis purpurea*

LDPEM/B-0364. Margins of leaves loosely rolled upwards. Ratlinghope, Shropshire, 1929. LNHS No. 201.

On *Lotus hispidus*

LDPEM/B-0485. Flowers distorted and sepals and terminal leaves with yellow hairs. (N.B. This is reminiscent of *Contarinia loti* (De Geer) (Diptera), but the sheet is annotated with '? not galled. Hairiness is normal.'). Cliffs south of Swanpool, Falmouth, Cornwall, 1922. LNHS No. 320.

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APPENDIX

A bibliography of publications on plant galls appearing in the journals of the London Natural History Society.

A. *Transactions of the London Natural History Society*

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|-------------|--|
| ANON | 1920. Report of plant gall section, 1919: 25-27. |
| HALL, L. B. | 1918. Plant gall committee report for 1917: 21-23. |
| HALL, L. B. | 1919. Report of plant gall section, 1918: 21-22. |
| HALL, L. B. | 1921. Report of plant gall section, 1920: 29-32. |

B. *The London Naturalist*

From 1922 to 1930, plant gall records of note from the whole of Britain were incorporated into the annual reports of the plant gall section by Burkill. From 1931 onwards, a change of format restricted the content of these annual reports to an account of the section's activities during the year. This was accompanied by an enlarged list of notable records elsewhere in the same volume of the journal.

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| BEVEN, G. | 1967. Birds feeding on plant galls in Survey of Bookham Common – twenty-fifth year. 46 : 114-115. |
| BURKILL, H. J. | 1922. Report of the Plant Gall Section, 1921. 1 : xiv-xv. |
| BURKILL, H. J. | 1923. Plant Gall Section (in <i>Report of the sections</i>). 2 : 16-17. |
| BURKILL, H. J. | 1924. Plant gall section (in <i>Reports of the sections</i>). 3 : 19-22. |
| BURKILL, H. J. | 1925. Plant gall section (in <i>Report of the sections</i>). 4 : 30-32. |
| BURKILL, H. J. | 1926. Plant gall section (in <i>Reports of the sections</i>). 5 : 37-38. |
| BURKILL, H. J. | 1927. Notes on plant galls. 6 : 38-39 (illustrated). |
| BURKILL, H. J. | 1927. Plant galls section (in <i>Reports for the year</i>). 6 : 49-51. |
| BURKILL, H. J. | 1928. Plant galls section (in <i>Reports for the year</i>). 7 : 42-43 and 54. |
| BURKILL, H. J. | 1929. Reports for the year: plant galls. 8 : 80-83. |
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| BURKILL, H. J. | 1932. Plant galls section report for 1931. 11 : 19. |
| BURKILL, H. J. | 1932. An introduction to the study of plant galls. 11 : 42-47. |
| BURKILL, H. J. | 1932. Plant gall records for 1931. 11 : 93-97. |
| BURKILL, H. J. | 1933. Plant galls section report for 1932. 12 : 18-19. |
| BURKILL, H. J. | 1933. Plant gall records for 1932. 12 : 117-119. |
| BURKILL, H. J. | 1934. Plant galls section report for 1933. 13 : 18-19. |

- BURKILL, H. J. 1934. Three interesting plant galls. **13**: 99 (illustrated).
- BURKILL, H. J. 1934. Plant gall records for 1933. **13**: 99-102.
- BURKILL, H. J. 1935. Plant galls section report for 1934. **14**: 19.
- BURKILL, H. J. 1935. Plant gall records for 1934. **14**: 96-100.
- BURKILL, H. J. 1936. Plant galls section report for 1935. **15**: 15.
- BURKILL, H. J. 1936. Plant gall records for 1935. **15**: 72-75.
- BURKILL, H. J. 1937. Plant galls section report for 1936. **16**: 15-16.
- BURKILL, H. J. 1937. Plant gall records for 1936. **16**: 58-61.
- BURKILL, H. J. 1938. Plant galls section report for 1937. **17**: 16.
- BURKILL, H. J. 1938. Plant galls of Limpsfield Common. **17**: 64-66.
- BURKILL, H. J. 1938. Plant gall records for 1937. **17**: 83-86.
- BURKILL, H. J. 1939. Plant gall records for 1938. **18**: 32-36.
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- BURKILL, H. J. 1940. Plant gall records for 1939. **19**: 23-24.
- BURKILL, H. J. 1940. Plant galls section report for 1939. **19**: 42-43.
- BURKILL, H. J. 1941. Plant gall records for 1940. **20**: 17-18.
- BURKILL, H. J. 1942. Plant gall records for 1941. **21**: 13-14.
- BURKILL, H. J. 1943. Plant gall records for 1942. **22**: 24-25.
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- BURKILL, H. J. 1946. Plant gall records for 1945. **25**: 47-48.
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- BURKILL, H. J. 1947. Plant gall records for 1946. **26**: 78-79.
- BURKILL, H. J. 1949. Plant gall records for 1948. **28**: 116-117.
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- LE GROS, A. E. 1972. Survey of Bookham Common – twenty-ninth year: Cynipidae. **50**: 104.
- LE GROS, A. E. 1972. Gall midges of the pedunculate oak. **51**: 63-67. :Includes a key to species).
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- NIBLETT, M. 1931. Some gall-causing Trypetidae. **10**: 139-141.
- NIBLETT, M. 1931. Cynipid oak galls in Surrey during 1930. **10**: 141-142.
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- NIBLETT, M. 1950. Plant galls of Bookham Common. **29**: 90-92.
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Book Review

The Butterflies of Hertfordshire. By Brian Sawford. Castlemead Publications, Ware, 1987. 195pp. £15.00. ISBN 0 948555 03 3.

The fact that Gordon Benningfield, a resident of Hertfordshire, agreed to write the foreword to this county publication is itself an indication that the work is one of quality; even a cursory examination of its content will bear this out. In the last few years there has been a veritable deluge of books on butterflies (three are reviewed in this volume of *The London Naturalist* alone) and, quite frankly, the average butterfly-book buyer is getting a little fed up and more and more short of cash. However, *The Butterflies of Hertfordshire* is one of the better county faunas and will be of particular interest to L.N.H.S. members since about one third of that county lies within our own 'London Area'.

The standard approach of including introductory chapters on the area covered by the survey, its geology, climate and available butterfly habitats is adopted. This is all contained in a fairly short section and provides the reader with the background information needed to understand fully the species accounts which comprise the bulk of the work. There is a most informative and accurate account of the history of recording butterflies in Hertfordshire which I found to be particularly interesting and, bringing up the rear, a chapter on conservation and the future. It is of course, in the end, this final chapter which is of the greatest importance and, as the author hopes, the book should be used 'as an active conservation guide to Hertfordshire's butterflies and their habitats'. I would question, however, the wisdom of including a list of the county's top twenty-five butterfly sites. I know from bitter experience that the uninformed local authority planner will often assume that this renders all remaining sites 'fair game'. More valuable perhaps would have been a table of the bottom twenty-five sites – those where conservation measures are perhaps a little more urgent?

This is certainly one of the better county butterfly books to appear in recent years and this alone will justify its purchase by any butterfly enthusiast. It is admirably enriched with forty-six photographically excellent four-colour plates of individual species, all taken by the author, and the standard of reproduction of these, particularly the colours, which so many publishers simply can not get right, is excellent. Tetrad maps are included with text and show distributions in two date-bands (using 1970 as the cut-off point). The work is nicely bound and should therefore survive well on the bookshelf. After *The Butterflies of the London Area* (which for the sake of non-members, was written by myself!) it receives my recommendation as a book suitable for any London-based naturalist to find under the Christmas tree in 1988.

COLIN W. PLANT

Survey of Bookham Common

FORTY-SIXTH YEAR Progress Report for 1987

General (Geoffrey Beven*)

On 20 July 1987 the L.N.H.S. Council approved the building of a new research hut on a concrete base, providing that sufficient work be done to justify the expenditure and that further publicity be given to the Society's work at Bookham, both through the *Newsletter* and the National Trust. The hut would be under the control of the Bookham Committee but would be available for use by other sections. The hut will be made in sections elsewhere during the winter and is not expected to be put up until Spring 1988. Ken Page is acting in this matter on behalf of the Survey.

We are sorry to hear that Alfred Wilton died in February 1987 at the age of 90. He was one of the leaders in the bird census work at the beginning of the Survey.

Nicola Penford B.Sc., M.Sc. has left the Surrey Wildlife Trust after 18 months and has been appointed to the Nature Conservancy Council to take up uplands survey work.

On 3 November a war-time incendiary bomb was found on Hollows Path 593 (I.S.).

Storm Damage on Bookham Common (Ian F. Swinney†, National Trust Warden)

The exceptionally high winds of early Friday 16 October 1987 have caused the loss of millions of trees and much damage to property throughout southeast England. In many areas the devastation was very noticeable, especially on high ground or slopes vulnerable to the southerly wind. The damage to the trees on Bookham Common is not immediately obvious; one or two areas are badly hit but in the main it appears that we 'got off lightly'. This impression fades on close examination of the pedunculate oak *Quercus robur* which dominates the woodland areas. Many of the fine old oaks and hundreds, if not thousands, of the intermediate ones have severe damage to the branches. These 'hang-ups' ('widow-makers' is a favourite forestry term) are extremely dangerous and care should still be taken if visiting the Common. Some of these trees will have to be felled and many will rot prematurely as a result of these large wounds.

The largest areas which have been 'clear-felled' by the wind are along Mark Oak Wood on the eastern boundary and over Cobham Road (south of Sheepbell Farm) where the middle of the wood has been flattened. Other localised damage occurs by Sheepbell Pond and at Mark Oak car park. There are hundreds of trees down individually or in twos or threes throughout the wooded areas of the Common and on to the plains.

The species most commonly blown over was Turkey oak *Quercus cerris*, especially on the sand and flint 'Gravel Plateau' of the Common, with birch *Betula pendula* in similar numbers. Some sweet chestnut *Castanea sativa* were blown over especially along Mark Oak Path and in 'The Birches' 259. Other species uprooted by the wind include aspen *Populus tremula*, sycamore *Acer pseudoplatanus* and some pedunculate oak and ash *Fraxinus excelsior*, though it should be noted that these were poorly rooted specimens growing on the sand and flint. 'Snapped-off trees' included ash, oak and hybrid poplars in Hundred Pound Wood.

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It must be remembered that most of the trees at the time of the 'Great Storm' were in full leaf and therefore their wind resistance was far greater than in the winter – this combined with winds of over 90 m.p.h. was bound to wreak havoc. In fact many dead and decidedly weak trees were still standing among all the fallen live trees, due to their lack of leaves. Not all the trees that came down were necessarily poorly rooted: if a healthy tree has one weighing several tons leant against it when it is blowing about already, then it can prove too much, and this in turn can lead to a 'knock-on' effect (like a stack of playing cards) through a whole area of woodland. Many trees were damaged by the ones falling beside them. Another factor that went unnoticed was that it was one of the wettest Octobers since records began, so that the trees had their roots in some fairly soft, wet ground, though the largest contributory factors would seem to be, species of tree, exposure to southerly winds and soil type. Very few pedunculate oaks with their roots in the London Clay blew over in the storm. The trouble is their branches broke instead. I have never seen oak bent over so much by the wind that day, but then it is hardly surprising with the great sudden gusts.

Many people asked what had happened to the birds, as for two days after the storm it was very quiet. Alan Snow (of Handley's Cottage) reported a roe deer *Capreolus capreolus* running backwards and forwards in a state of panic: as you can imagine it must have wondered where to run to. This leads me to ask were the animals, especially the birds, suffering from some sort of trauma after the gale? One wonders.

The worst effect of the storm has been on the older, more brittle pedunculate oaks, as some fine specimens have lost many large branches. More will have to be felled along the paths as safety is a major concern. However, as many as possible will be saved, as when they decay they will be excellent hosts for other wildlife. Most of the fallen trees will be left in place. This has always been the Trust's policy and it is perhaps worth mentioning here that even where forestry is a main concern, the National Trust will only select trees from 75% of its broadleaved woodland – leaving a quarter of it to its own devices (or helping to enhance it for wildlife). This figure may even now be out of date as the Trust is placing more and more emphasis on conservation. Certainly our aim on Bookham Common is to maintain and enhance the wildlife habitats and hopefully our woodland will continue to have dead fallen trees, standing dead trees, hollow and 'over-mature' trees and those of all ages down to acorns! This will provide the 'varied infrastructure' we wish to maintain, and it is one of the benefits of the storm. It has, after all, removed some of the less desirable Turkey oaks which we wanted to fell anyway and has let more light into the woodland, hopefully increasing the variety of wildlife.

Woodlands of Bookham Common (Bryan Radcliffe*)

There is little doubt that woods of Bookham Common are 'Ancient Woodlands'. Evidence in the Domesday Survey of 1086 shows that there were oakwoods sufficient for feeding 90 or so hogs (Harvey 1943). Although there is no mediaeval description of the Common, in 1538 some trees there were used as valuable timber for the building of Nonsuch Palace; so much so that in 1614 it was noted there were no longer any good timber trees on the Common. In 1721 reference is made to several pieces of woodland (200 acres) (Harvey 1943).

Peterken (1981) found that certain plants were virtually confined to ancient woods. Colebourn and Gibbons (1987) give a list of 99 of these 'Ancient Woodland Indicator Species' found in the south of England, and stated that the richest woods may have 45-65 species.

It would be unrealistic to expect any single wood in England to carry all 99 species. A number of these, although sometimes locally frequent, are national rarities, like *Pulmonaria longifolia* and *Ornithogalum pyrenaicum*. Their dis-

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tributions are so disjunct as to preclude the possibility of them being naturally present in most areas. Another group has definite edaphic requirements and where these requirements are not available then these species must of necessity be absent. When considering a particular piece of woodland therefore some species must be eliminated from the list of potential indicators.

A conservative assessment of the above limitations applicable to Bookham Common would eliminate at least 20 species, so that the potential for this woodland could not exceed 79.

In the wooded portion of the Bookham Survey area 55 species from the list have been recorded (Radcliffe and Page 1981). A further three species, *Polystichum aculeatum*, *Ranunculus auricomus* and *Sorbus torminalis* are present in the woodland, although outside the selected Survey area, bringing the total recorded indicator species to 58. This high proportion of the potential is significant evidence for the antiquity of the woodlands of Bookham Common.

APPENDIX

Plants, which in southern England, are likely to indicate an ancient woodland community (Colebourn and Gibbons 1987). Those plants that have been recorded in the Bookham woodlands are prefixed with an asterisk.

* <i>Acer campestre</i>	* <i>Euphorbia amygdaloides</i>	<i>Platanthera chlorantha</i>
* <i>Adoxa moschatellina</i>	* <i>Festuca gigantea</i>	* <i>Poa nemoralis</i>
* <i>Allium ursinum</i>	* <i>Frangula alnus</i>	<i>Polygonatum multiflorum</i>
* <i>Anemone nemorosa</i>	* <i>Galium odoratum</i>	<i>Polypodium vulgare</i>
* <i>Aquilegia vulgaris</i>	<i>Gewn rivale</i>	* <i>Polystichum aculeatum</i>
<i>Blechnum spicant</i>	* <i>Gnaphalium sylvaticum</i>	* <i>Polystichum setiferum</i>
* <i>Bromus ramosus</i>	<i>Helleborus viridis</i>	* <i>Populus tremula</i>
<i>Calamagrostis epigejos</i>	* <i>Holcus mollis</i>	* <i>Primula vulgaris</i>
<i>Campanula trachelium</i>	<i>Hordelymus europaeus</i>	* <i>Prunus avium</i>
<i>Cardamine amara</i>	* <i>Hypericum androsaemum</i>	<i>Pulmonaria longifolia</i>
<i>Cardamine bulbifera</i>	* <i>Hypericum pulchrum</i>	<i>Quercus petraea</i>
<i>Carex laevigata</i>	* <i>Iris foetidissima</i>	* <i>Ranunculus auricomus</i>
<i>Carex pallescens</i>	* <i>Lamiasium galeobdolon</i>	* <i>Ribes nigrum</i>
* <i>Carex pendula</i>	<i>Latiraea squamaria</i>	* <i>Ribes rubrum</i>
* <i>Carex remota</i>	* <i>Lathyrus montanus</i>	* <i>Rosa arvensis</i>
* <i>Carex strigosa</i>	<i>Lathyrus sylvestris</i>	* <i>Ruscus aculeatus</i>
* <i>Carex sylvatica</i>	* <i>Luzula forsteri</i>	* <i>Sanicula europaea</i>
* <i>Carpinus betulus</i>	* <i>Luzula pilosa</i>	<i>Scirpus sylvaticus</i>
<i>Cephalanthera longifolia</i>	<i>Luzula sylvatica</i>	<i>Scirpus telephium</i>
<i>Chrysosplenium alternifolium</i>	* <i>Lysimachia nemorum</i>	* <i>Serratula tinctoria</i>
<i>Chrysosplenium oppositifolium</i>	* <i>Malus sylvestris</i>	<i>Solidago virgaurea</i>
<i>Colchicum autumnale</i>	<i>Melampyrum pratense</i>	* <i>Sorbus torminalis</i>
* <i>Convallaria majalis</i>	* <i>Melica uniflora</i>	* <i>Stachys officinalis</i>
* <i>Crataegus laevigata</i>	<i>Milium effusum</i>	* <i>Tanacetum commune</i>
<i>Daphne laureola</i>	* <i>Myosotis sylvatica</i>	<i>Tilia cordata</i>
<i>Dipsacus pilosus</i>	<i>Narcissus pseudonarcissus</i>	* <i>Ulmus glabra</i>
* <i>Dryopteris affinis</i>	<i>Neottia nidus-avis</i>	<i>Vaccinium myrtillus</i>
* <i>Dryopteris carthusiana</i>	<i>Orchis mascula</i>	* <i>Veronica montana</i>
* <i>Elymus caninus</i>	<i>Oreopteris limbosperma</i>	* <i>Viburnum opulus</i>
* <i>Epipactis helleborine</i>	<i>Ornithogalum pyrenaicum</i>	* <i>Vicia sepium</i>
<i>Epipactis leptochila</i>	* <i>Oxalis acetosella</i>	<i>Vicia sylvatica</i>
* <i>Epipactis purpurata</i>	<i>Paris quadrifolia</i>	<i>Viola palustris</i>
<i>Equisetum sylvaticum</i>	* <i>Phyllitis scolopendrium</i>	* <i>Viola reichenbachiana</i>

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Fungi (Peter C. Holland*)

In 1987 Pamela Goldsmith found the following species, new to Bookham Common.

Russula aeruginea
Russula betularum
Russula claroflava

Found on Foray taken by Audrey Thomas in Eastern Wood on the 6 September.

Conocybe subpubescens
Cortinarius obtusus
Cortinarius paleaceus
Cortinarius uliginosus
Gyroporus castaneus
Hyocybe eutheles
Panaeolus sphinctrinus

Found on a Foray taken by Dr B. Spooner on the 14 October.

These Fungi have not been reported before on the Common.

The correct spelling of some of the fungi mentioned in *Lond. Nat.* **65**: 184 (1986) and *Lond. Nat.* **66**: 159 (1987) are as follows:

L.N. 1986 *Entomopluthora muscae*
Cellyphla goldbachii
Dasyscyphus pulverulentus
Uromyces ficariae
Hyaloscypha hyalina
Pezizella amentii
Niptera melatephra
Unguicularia millepunctata

L.N. 1987 *Hypoxylon fragiforme*
Mycena clavularis

Some of the species published in these two lists were not, in fact, new records, having been published in earlier issues of *The London Naturalist*, sometimes under names which have now fallen into synonymy.

Bryophytes (Oliver B. J. French†)

For the third year in succession family and domestic affairs have enforced my absence from far too many Survey meetings with the result that the inadequate amount of work done is reflected in poor yield in terms of records. No new species have been discovered and the number of new area records is disappointing.

HEPATICA

Pellia epiphylla C

MUSCI

Dicranum scoparium B
Campylopus pyriformis I
C. paradoxus F
Barbula convoluta Q
Bryum rubens I
†*Aulacomnium palustre* T
Brachythecium velutinum I
Hypnum mammillatum P

†During his 1941/1967 work on the Common C.P. Castell recorded *Aulacomnium palustre* from three areas, D, L and T. Some years ago Rod Stern refound some plants on Castell's old site in Area D but the inexorable spread of scrub soon

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†Deceased. An obituary appears on p. 182.

swamped the heathy area where he found them and they have now vanished from the scene. This year Ella Hillman rediscovered some plants in another old Castell area but it seems unlikely that the species will recur again in Area L since this is now thickly wooded with no apparently suitable habitat.

The great storm of last October felled a large number of trees at Bookham, but *Quercus robur* seems to have survived extremely well for the most part with merely the loss of a good deal of top-hammer from the taller trees. Hitherto it has been impossible to investigate the epiphytic bryophytes located out of reach of somebody standing on the ground; until the prescribed cleaning-up operations are completed we now have an unexpected chance to check what plants grow higher up the trunks of several tree species and to examine their canopies; initial work on this has already started.

If the interesting suggestion of Ian Swinney, National Trust Warden, that the storm devastation in the rarely visited block of N.T. woodland lying to the north of Area C and across the Cobham Road outside the present Survey Area be allowed to remain undisturbed by clearance work is accepted, we shall have an unrivalled opportunity for the long-term monitoring of the existing epiphytic bryophyte populations on the fallen trees and of the future succession of other species.

Aquatic Invertebrates (John W. Coles*)

The following specimens were collected from the ponds during 1987:

Coelenterata: *Hydra viridis* was found on 30 May and brown *Hydra* sp. on 11 October, both in Lower Eastern Pond. **Nematoda:** on 30 May free-living forms were fairly common in Eastern Hollows Pond, including *Diplogaster rivalis* (Leydig, 1854) (= *D. micans* Schultze in Carus, 1857), a new record for Bookham Common, and *Monhystera paludicola* de Man, 1880, while on 11 October two male *Tobrilus gracilis* (Bastian, 1865) were found there, when also females of *T. ? gracilis* (Bastian, 1865) were in Lower Eastern Pond, and *Monhystera paludicola* de Man in Western Hollows Pond. **Rotifera:** *Asplanchna* sp. was very common in the Isle of Wight Pond on 30 May. **Oligochaeta:** Naididae: *Dero* sp. were in the Isle of Wight Pond on 11 October.

L. V. Martin and A. P. Saunders-Davies, of the Quekett Microscopical Club, identified three species of Rotifera, new to Bookham Common, in the Isle of Wight and Western Hollows Ponds on 18 October, i.e. *Filinia longiseta*, *Asplanchna priodonta* and *Euchlanis dilatata*.

Hirudinea (Geoffrey Beven)

It appears that the leeches found in the Isle of Wight Ditch on 25 April 1986 (*L. N.* 66: 159) escaped, before they could be examined by 'experts'. The record of medicinal leeches must therefore be in some doubt. The medicinal leech *Hirudo medicinalis* was last found by E. W. Groves on 12 March 1961 in the Isle of Wight Pond (*Lond. Nat.* 54: 45-46).

Lepidoptera (Geoffrey Beven)

Published in 1987 was 'The Ecology and Conservation of the Purple Emperor Butterfly *Apatura iris*', by K. J. Willmott, a report on project BSP/2 for the World Wildlife Fund, 1984-1986.

Kenneth Willmott has been carrying out a special survey of the habits of this species in various localities, but mainly on Bookham Common, where he has done an enormous amount of detailed work and put in many hours of careful observation. He has also included a fine series of very interesting photographs. He is to be congratulated on a notable achievement. This book is marked as 'Confidential', but the author has given us permission to refer to it.

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A list of the moths of Bookham Common was published by Wheeler (1955). Since then the following species have been recorded:

1. By A. S. Wheeler (Beven 1966):

<i>Apamea lithoxylaea</i>	Light arches
<i>Photedes minima</i>	Small dotted buff

2. By C. B. Ashby (Beven 1966):

<i>Arctia villica britannica</i>	Cream-spot tiger
<i>Mythimna comma</i>	Shoulder-striped wainscot
<i>Photedes pygmina</i>	Small wainscot
<i>Dypterygia scabriuscula</i>	Bird's wing
<i>Hydraecia micacea</i>	Rosy rustic
<i>Brachionycha sphinx</i>	The sprawler
<i>Aporophyla nigra</i>	Black rustic
<i>Omphaloscelis lunosa</i>	Lunar underwing
<i>Agrochola lychnidis</i>	Beaded chestnut
<i>Agrochola litura</i>	Brown-spot pinion
<i>Xanthia citrigo</i>	Orange sallow
<i>Xanthia aurago</i>	Barred sallow
<i>Xanthia togata</i>	Pink-barred sallow
<i>Autographa pulchrina</i>	Beautiful golden Y
<i>Ennomos fuscantaria</i>	Dusky thorn

3. By C. B. Ashby (1967):

<i>Odontotia carmelita</i>	Scarce prominent
<i>Cerastis rubricosa</i>	Red chestnut
<i>Agrochola lota</i>	Red-line quaker
<i>Chesias legatella</i>	The streak

4. By C. B. Ashby (1968):

<i>Agrotis segetum</i>	Turnip moth
<i>Agrotis ipsilon</i>	Dark sword-grass

5. By C. B. Ashby (1969):

<i>Drymonia ruficornis</i>	Lunar marbled brown
<i>Peridroma saucia</i>	Pearly underwing
<i>Cucullia chamomillae</i>	Chamomile shark
<i>Agrochola macilenta</i>	Yellow-line quaker
<i>Agrochola helvola</i>	Flounced chestnut
<i>Ennomos erosaria</i>	September thorn

6. During 1987 G. A. Collins recorded the following:

<i>Hepialus lecta</i>	Gold swift
<i>Zeuzera pyrina</i>	Leopard
<i>Habrosyne pyritoides</i>	Buff arches
<i>Idaea straminata</i>	Plain wave
<i>Mesoleuca albicillata</i>	Beautiful carpet
<i>Eulithis prunata</i>	Phoenix
<i>Thera obeliscata</i>	Grey pine carpet
<i>Philereme vetulata</i>	Brown scallop
<i>Euphyia unangulata</i>	Sharp-angled carpet
<i>Perizoma alchemillata</i>	Small rivulet
<i>Eupithecia tenuiata</i>	Slender pug
<i>Chloroclystis v-ata</i>	V pug
<i>Chloroclystis chloerata</i>	Sloe pug
<i>Lobophora halterata</i>	Seraphim
<i>Pterapherapteryx sexalata</i>	Small seraphim
<i>Semiothisa liturata</i>	Tawny-barred angle
<i>Ourapteryx sambucaria</i>	Swallow-tailed moth
<i>Ectropis consonaria</i>	Square spot
<i>Bupalus piniaria</i>	Bordered white
<i>Hylaea fasciaria</i>	Barred red
<i>Hyloicus pinastri</i>	Pine hawk
<i>Cyboxia mesomella</i>	Four-dotted footman

<i>Eilema complana</i>	Scarce footman
<i>Nola confusalis</i>	Least black arches
<i>Agrotis clavus</i>	Heart and club
<i>Agrotis exclamationis</i>	Heart and dart
<i>Axylia putris</i>	Flame
<i>Noctua comes</i>	Lesser yellow underwing
<i>Noctua fimbriata</i>	Broad-bordered yellow underwing
<i>Noctua janthina</i>	Lesser broad-border
<i>Noctua interjecta</i>	Least yellow underwing
<i>Graphiphora augur</i>	Double dart
<i>Lycophotia porphyrea</i>	True lover's knot
<i>Diarsia brunnea</i>	Purple clay
<i>Diarsia rubi</i>	Small square spot
<i>Xestia triangulum</i>	Double square-spot
<i>Lacanobia w-latinum</i>	Light brocade
<i>Lacanobia oleracea</i>	Bright-line brown-eye
<i>Acronicta megacephala</i>	Poplar grey
<i>Acronicta alni</i>	Alder
<i>Cryphia domestica</i>	Marbled beauty
<i>Apamea remissa</i>	Dusky brocade
<i>Apamea anceps</i>	Large nutmeg
<i>Apamea scolopacina</i>	Slender brindle
<i>Oligia latruncula</i>	Tawny marbled minor
<i>Mesapamea secalis</i>	Common rustie
<i>Mesapamea secalella</i>	Lesser common rustie
<i>Hoplodrina blanda</i>	Rustic
<i>Caradrina clavipalpis</i>	Pale mottled willow
<i>Elaphria venustula</i>	Rosy marbled
<i>Autographa jota</i>	Plain golden Y
<i>Abrostola triplasia</i>	Spectacle
<i>Herminia tarsipennalis</i>	Fan-foot

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Diptera: Syrphidae (Geoffrey Beven)

Graham A. Collins collected 52 species of hoverfly (Syrphidae) on Bookham Common in 1987. Many of these have been recorded previously by Parmenter (1950, 1960), but the following species appear to be new to the Common:

	29 Apr.	20 May	17 June	5 Aug.	19 Aug.
<i>Epistrophe grossulariae</i>			×		×
<i>Leucozonía glauca</i>				×	
<i>Leucozonía laternaria</i>			×		
<i>Melangyna labiatarum</i>			×		
<i>Malangyna unbellatarum</i>					×
<i>Sphaerophoria taeniata</i>				×	
<i>Cheilosia impressa</i>			×		
<i>Cheilosia soror</i>				×	
<i>Cheilosia variabilis</i>			×		
<i>Ferdinandea cuprea</i>			×		
<i>Rhingia campestris</i>	×				
<i>Chrysogaster chalybeata</i>				×	
<i>Neoascia interrupta</i>			×		
<i>Neoascia podagrica</i>	×			×	
<i>Orthonevra splendens</i>			×		
<i>Anasimyia contracta</i>			×		
<i>Eristalis intricarius</i>		×		×	
<i>Eristalis pertinax</i>		×		×	

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Birds (Geoffrey Beven)

Population Studies

Andrew Merritt made four visits between April and July 1987 to the 16-hectare sample of dense pedunculate oakwood. Although this is rather few visits compared with previous counts, it is perhaps worth giving the results. In 1982, 1983, 1984 and 1987 the wren *Troglodytes troglodytes* territories were 33, 21, 27 and 21, of blackbird *Turdus merula* 14, 13, 12 and 10, and of the robin *Erithacus rubecula* 28, 26, 26 and 29. Thus the wren population has decreased again but the blackbirds and robins have remained much the same. The number of great tits *Parus major* has increased, the figures for the same years being 11, 11, 13 and 19, and the number of blue tits *P. coeruleus* has remained the same, the corresponding figures being 19, 21, 23 and 23.

Unfortunately, no census was made in the 39 hectares of scrub and grassland during 1987.

Birds in 1987

On 8 March a pair of herons *Ardea cinerea* were nest-building in the canopy of *Quercus robur* in Eastern Wood 615 but it was, apparently, unsuccessful. (E.W.G. *et al.*). Two males and a female shelduck *Tadorna tadorna* were on the Isle of Wight Pond 585 on 26 October (A.P.). This is the first record for the Common. A moorhen *Gallinula chloropus* was found caught in fishing line on 8 November on the Isle of Wight Pond and was rescued by Ian Swinney. Previously, a blue tit, a coot *Fulica atra* and a carrion crow *Corvus corone* have all been found tangled in discarded fishing line (*Lond. Nat.* **55**: 22).

Accipitridae: Buzzard

The buzzard *Buteo buteo* is an occasional visitor, occurring in February 1977, March '61 and '74, May '76, 13-14 July '87, August '68 and September (twice) '76 (G.B., N.D., J.E.D., M.E., F.C.R., I.S., M.M.T.). It is usually seen swooping low or flying heavily with slow flapping and a few glides, or soaring, but it was twice seen perched in trees.

Turdinae: The Chat-like Thrushes

One pair of whinchats *Saxicola rubetra* generally bred on the plains before the Second World War, and certainly nested in 1933, 1934, probably in 1935, a pair in the breeding season in 1938, while a male was singing on 18 May 1947. Since then they have occurred occasionally on passage, five records in early May and four records in August-September (H.B., G.B., P.W.E.C., K.G., I.G., L.P., J.E.R., Spreadbury 1957, J.S.W., A.R.W.).

The stonechat *S. torquata* nested in 1933, and 1934 (two pairs) but since has only been recorded once, on 9 October 1955 (G.B., L.P., J.E.R., Spreadbury 1957).

The wheatear *Oenanthe oenanthe* has occurred on passage in May (twice) and in September (once) (G.B.) and a pair of Greenland wheatears *O. o. leucorrhoa* on 12 May 1934 (R.C.H.).

The redstart *Phoenicurus phoenicurus* has also occurred on passage, five times between April and June, and three times in August-September (G.B., C.H., R.W.H., E.McE., M.H.R., Surrey Bird Cl. 1972, A.R.W.).

The robin breeds commonly in woods with undergrowth and coppices, although many leave the woodlands in the autumn (Beven 1976).

The nightingale *Luscinia megarhynchos* has no doubt been a summer visitor to the Common for many years, and has certainly occurred every year in which counts have been done since 1942. On the plains, about 40 ha (100 acres), they frequent the dense thickets of thorn scrub. Nightingales have been recorded from squares 41-42, 44-45, 46, 49, 54, 57-58, 76, 81-82, 84-85, 87-88. Davis (1982) states that 'where several visits were made to a site holding a number of nightingales, often a different number of singing males was recorded on each occasion; in such cases the maximum count was the one used in the final analysis. In any census of this sort some birds will inevitably escape notice and this is particular true of a nocturnal species; the numbers found are bound to be an underestimate of the true total present.' Thus, and also because of further information, the figures quoted sometimes differ from those previously published. The numbers of male singing territories were – 1942 2, '43 1, '44 2, '45 3, '48 2, '52 2, '53 2, '54 2, '55 3, '56 3, '57 4, '58 1, '59 2, '60 1, '61 1, '62 2, '63 1, '64 4, '65 1, '66 1, '67 3, '68 4, '69 4, '70 5, '71 4, '72 5, '73 3, '74 2, '75 3, '76 6, '77 3, '78 3, '79 2, '80 3, '81 2, '82 1, '83 2, '84 3, '85 4, '86 4, and '87 3 (G.B., D.A.B., P.W.E.C., R.A.F., E.M.H., R.K., W.D.M., I.S., A.R.W.).

There was much tree felling in the woods in the First World War (Spreadbury 1957) and presumably also in the Second World War as for some years afterwards the paths were quite wide and there were some open patches in the woodland. During this period a number of nightingales took up territories in the woodland as follows: Hill House Wood in 1953 1, '54 2, '56 1, '61 1, '63 1; in Central Wood '57 1, '59 1, '63 1, '66 1; in Eastern Wood '49 1, '53 1, '54 1, '55 2, '64 1, '72 1, '73 1; in South-east Wood '52 1, '53 1, '61 1 (G.B., E.M.H.). By this time the woodland had encroached on the paths and open parts, and had become more dense. After the storm damage of October 1987, it will be interesting to see if nightingales again occupy any open and less dense parts of the woodland. There were also three territories on Banks' Common in 1950 and two in 1951 (G.B.).

Call-notes of Jays

During February, March and April jays *Garrulus glandarius* fly excitedly about the woods in parties of 5-10 or more, in their spring display gatherings, uttering much noise and many curious cries. These cries are often a harsh rasping screech, but there is also quite a lot of song, high-pitched with perhaps peculiar soft, warbling and melodious fluty notes, sometimes like a rusty hinge, kept up for a long time. Meanwhile, there is a lot of posturing with erection of rump feathers and the crest raised. Many other sounds may be heard such as the 'oo-oo' notes, rather like the quavering hoot of a tawny owl *Strix aluco* or sometimes the hoot of a little owl *Athene noctua*, or even the 'kraa' notes of a crow *Corvus corone* or the high-pitched calls of a rook *Corvus frugilegus*. They may also make peculiar long drawn-out mewling notes, some like the high-pitched 'mew' note of a buzzard and also squawks. One was once apparently making a noise like the 'frank' of a heron which was just then noted flying over the wood. Often there are loud, harsh parrot-like cries and sometimes a loud persistent bell note in flight. Goodwin (1986) describes these calls in much greater detail although it is difficult to be sure that every one is mentioned as the description of the call is not always easy to compare (G.B.).

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Mammals (Geoffrey Beven)

On 21 November a dead swan *Cygnus olor* was found on Central Plain 848, partly eaten by foxes *Vulpes vulpes* (I.S.). Roe deer *Capriolus capriolus* were again often seen, single deer were observed 34 times, two were seen 27 times, including a doe with one young, three were seen seven times, four were seen three times, and five were seen twice (A.M., A.P., J.M.S., I.S.). On 26 April a doe and two young were being chased by greyhounds, the female decoyed the dogs away from her young and the deer all escaped (I.S.). A male was seen with antlers in velvet on 29 March (I.S.). On 28 April two roebucks were seen in territorial dispute 823 (I.S.).

Hedgehog

There are very few records of the hedgehog *Erinaceus europaeus*, probably because they are almost entirely nocturnal. There are seven records for the Isle of Wight area, one in Western Scrub, and no less than eight in or near Eastern Wood. The hedgehog is stated to be rare in dense woodland (Southern 1964), or most abundant where there is close proximity of grassland to woodland, e.g. edge of woods (Corbet and Southern 1977). Thus the number of records in Eastern Wood is perhaps surprising, but of course, all parts of the wood are not dense. The parts mentioned are perhaps the most often visited, and they probably occur over most of the Common. On 11 September 1966 the remains of one was found, consisting mainly of flattened skin with a few bones of one hind leg, smelling strongly of fox, which had probably eaten it. It had not been turned inside out, which foxes occasionally do (G.B.). On the other hand the skin of a young one 10-12 cms (4-5 ins) long on 14 August 1955 was indeed turned inside out, and was probably killed by a fox or badger (G.B.). Two dead ones were hanging on a keeper's gibbet just outside the Common at Hundred Pound Bridge on 15 May 1968 (G.B.). At dusk (19.00 hrs) on 19 April 1984 one was found eating a toad *Bufo bufo* south of Eastern Hollow Pond 595 (D.A.B., P.C.B.). K. Herter (1965) indicates that frogs, toads, lizards and snakes are occasionally eaten by hedgehogs. One was seen drinking water from a puddle at 21.50 hrs on Common Road on 22 July 1985 (I.S.), and as Morris (1983) states 'In the wild, hedgehogs drink often...'.

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Odonata (Ruth Day*)

When the Bookham ponds were visited on 1 June 1987, azure damselflies *Coenagrion puella* had emerged everywhere, and at Sheepbell Pond two male and one female large red damselfly *Pyrrosoma nymphula* were also seen.

Fieldwork was carried out between 25 July and 1 August for the third year of a mark/recapture population study (Day 1987). During that week, males of four dragonfly species were seen in ones and twos at Lower Eastern Pond: *Sympetrum*

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sanguineum, *Aeshna cyanea*, *Aeshna grandis* and *Anax imperator*. The first two species also occurred at South East Pond. Occasional individuals of the blue damselfly *Enallagma cyathigerum* and the blue tailed damselfly *Ischnura elegans* were seen at Lower Eastern Pond and are probably still breeding there. Both these species, however, were seen the same season in some numbers on the nearby River Mole and they might have been blown in by freak air currents as presumably was the female banded demoiselle *Calopteryx splendens* seen on 30 July at South East Pond and the male which appeared at Isle of Wight pond on 2 August.

Estimates have been made, using Jolly's stochastic method, of the populations of males of the two main damselfly species *Coenagrion puella* and the emerald damselfly *Lestes sponsa* (Begon 1979). Results over the three years are shown at Figures 1 to 3 and are set out in the table below. South East Pond was not surveyed in 1986. Both sexes of the two species emerge in approximately equal numbers (Banks and Thompson 1985, Corbet 1956a). Very few females are, however, to be found sitting about near water, so only males have been included in the study. Population estimates fluctuate considerably in any individual year as the number of male damselflies available for capture depends both on the weather and the time of day. All fieldwork was normally done between 11.30 and 16.00 hours.

Even allowing for these variations, the trends are clear. *L. sponsa* is breeding at all Lower Eastern Ponds but not at South East Pond, though occasional individuals are found there. Very few *L. sponsa* emerged in 1985, which was a cold wet year. *L. sponsa* overwinters as an egg in diapause and Corbet (1956b) found that the optimum water temperature for the development of the egg while in diapause was 10°C and that the lower temperature threshold for the hatching of the egg once diapause development was completed lay between 10 and 20°C. Normally this makes for synchronised hatching in April followed by rapid larval development and emergence in July (Corbet 1956a). Unfortunately no water temperatures were taken in the spring and summer of 1985 at Lower Eastern Pond, but the male population estimate for the first week of August in 1986 was 350. In 1987 it was 100 on 26 July rising to 250 on 30th July. This suggests a normal summer population of 500-700 adults (including females), but that in a cold year they will simply fail to hatch and spend an extra season in the egg.

Numbers of *C. puella* were depressed by the weather in 1985 at both South East and Lower Eastern Ponds. In 1987 there appeared to be a larger population at South East Pond, which the larva shares with larval *Anax imperator* (Day 1987), but not, apparently, with larval *L. sponsa*. The extended adult survey in 1985 showed that these insects hardly ever travel the 300m between the two ponds, so the population of each pond is distinct. Banks and Thompson (1985) found the same was true for two ponds 800m apart.

Population estimates for males of two species of damselfly at Bookham Common for 1985-7, using Jolly's stochastic method.

[illegible]

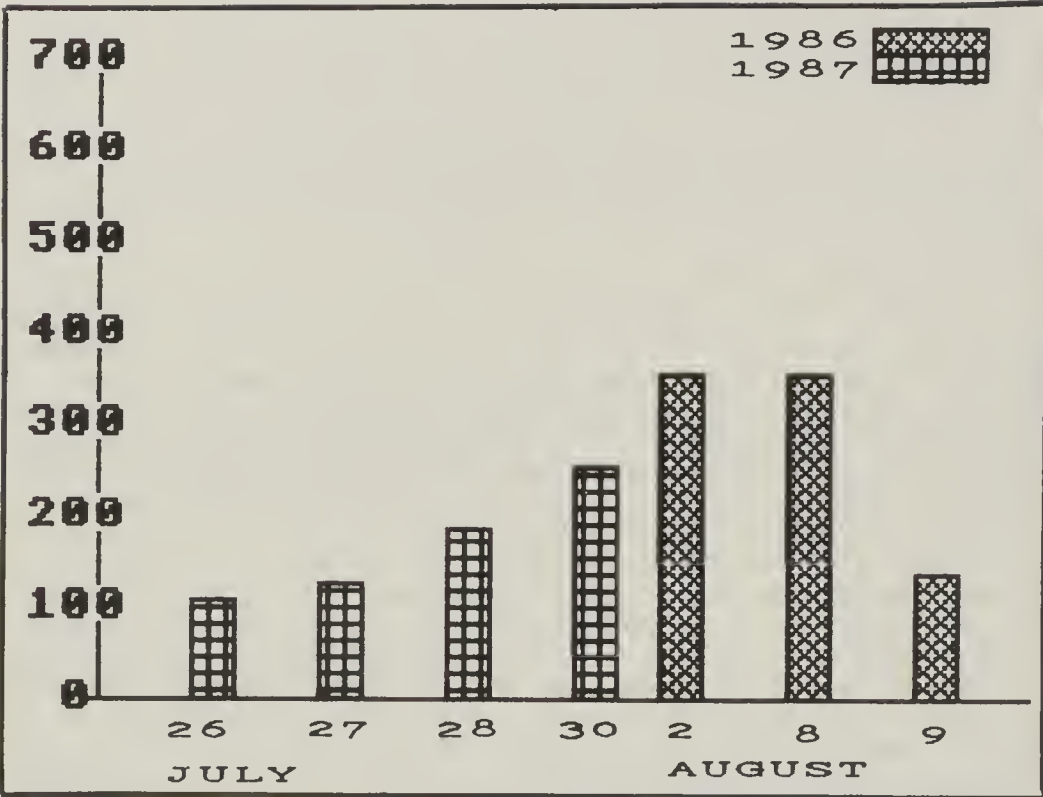


FIG. 1. Population estimates of male *Lestes sponsa* at Lower Eastern Pond in 1986 and 1987. Only a few individuals were found there in 1985.

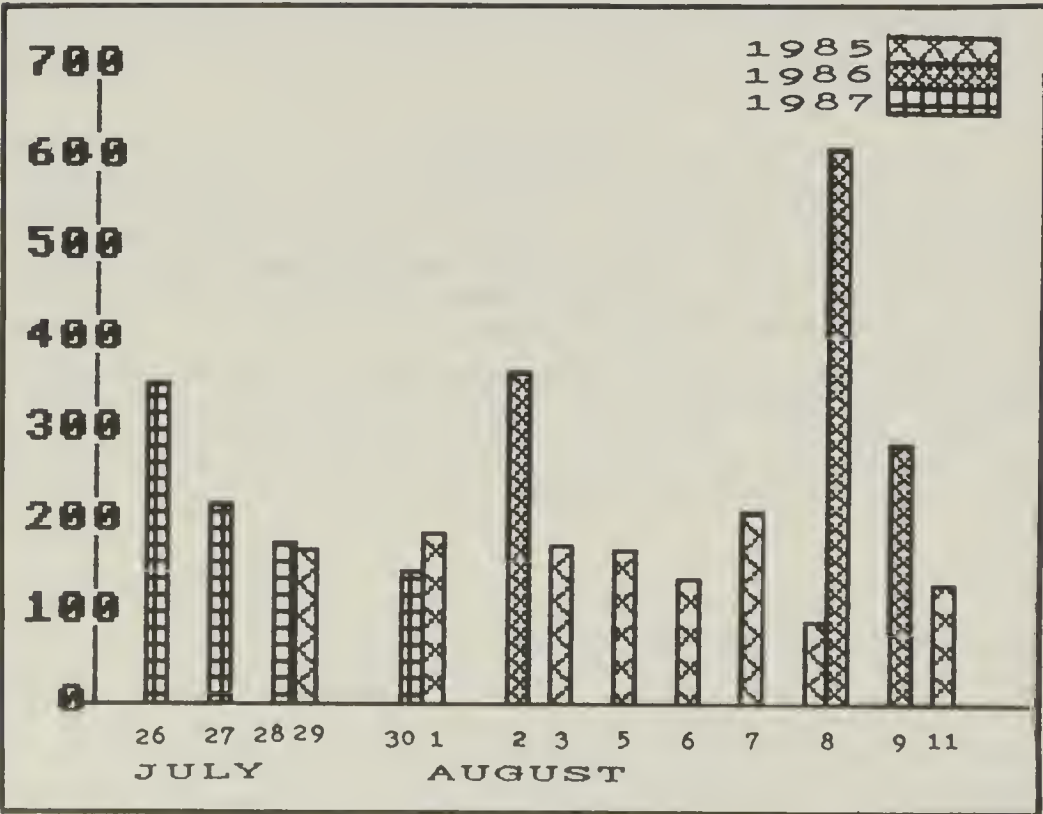


FIG. 2. Population estimates of male *Coenagrion puella* at Lower Eastern Pond 1985-7.

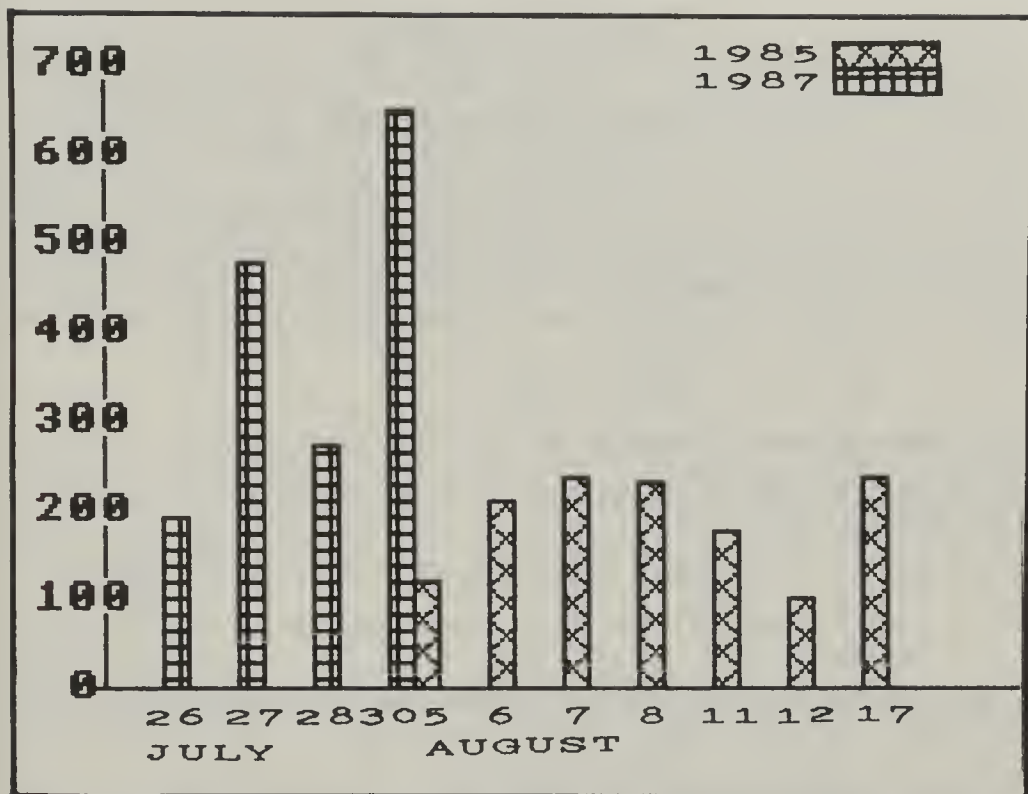


FIG. 3. Population estimates of male *Coenagrion puella* at South East Pond 1985 and 1987. This pond was not surveyed in 1986.

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Bat Records From The London Area During 1987

by SIMON MICKLEBURGH*

Introduction

Mickleburgh (1987) summarised information on the distribution and status of bats in the London area up to the end of 1986. This paper presents an update with bat records for 1987.

The London Bat Project was funded in 1987 by the London Boroughs Grants Scheme with administrative support from the Fauna and Flora Preservation Society.

Summer Roost Sites

In 1987, 92 new summer roosts were reported from the L.N.H.S. area. Appendix 1 gives a list of sites and locations. Species identification was made at 47 sites (51% of the total); 30 (64%) were used by pipistrelle *Pipistrellus pipistrellus*, 6 (13%) by brown long-eared *Plecotus auritus*, 5 (11%) by serotine *Eptesicus serotinus*, 4 (9%) by noctule *Nyctalus noctula* and 1 each (2%) by Daubenton's *Myotis daubentonii* and Leisler's *Nyctalus leisleri*. Notes on some of the species roosts are given below.

DAUBENTON'S BAT *Myotis daubentonii*

The fact that only two roosts have previously been located in the L.N.H.S. area makes the discovery in Rickmansworth all the more important. The method of discovery was, however, saddening. A local cat brought in around 70 dead Daubenton's bats in the space of two weeks. On investigation bats were found to be using a bridge as a temporary roost though the location of the maternity roost remains unknown.

LEISLER'S BAT *Nyctalus leisleri*

The record from Essex was the first roost for that county and for the L.N.H.S. area as a whole.

NOCTULE BAT *Nyctalus noctula*

The overall number of roosts known is still low but the one discovered in Bexley was of particular interest as it appeared to be an autumn mating roost as well as a winter site. The number of trees found to be used in Highgate Wood continues to increase though one site was lost as a result of the October storm (see below).

SEROTINE BAT *Eptesicus serotinus*

This is still a rarely recorded species in the London area. Serotines often roost at the highest point on the gable ends of buildings, so it was unusual to find that the bats in Teddington were roosting above the cupboard under the stairs almost at ground level! Their exit point was unknown. The roost in Romford was the first recorded in the Borough of Havering.

Winter Roost Sites

No new winter roost sites were found within the L.N.H.S. area in 1987. Bats were recorded from 17 sites. Daubenton's bats were seen at 14 sites (82% of total), Natterer's at 13 (76%), brown long-eared at 11 (65%), whiskered at 8 (47%), Brandt's at 1 (6%), whiskered/Brandt's at 6 (35%) and northern bat at 1 site (6%).

The numbers recorded from winter sites was small; only three sites. Grays (1), Westerham and West Humble, were used by more than 20 bats.

The full results are given in Appendix 2.

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Feeding Area Survey

All the feeding area records were made using bat detectors coupled with visual observation. A total of 72 visits were made to 63 sites and 50 (81%) were used by bats. Positive identification of species was made at 41 sites (82%) and pipistrelles were seen feeding at 35 sites (85%), noctule or Leisler's at 20 (49%) and Daubenton's at 10 (24%). Appendix 3 gives the full results.

Miscellaneous Bat Records

Appendix 4 lists other bat records from 1987. These were mainly individuals found dead or injured.

The Storm of 15-16 October 1987

During the night of 15-16 October 1987 a storm tracked across southern Britain bringing with it hurricane-force winds. Wind speeds in excess of 90 m.p.h. were recorded in some areas. Many millions of trees were blown down or severely damaged that night. Many of the victims were mature or over mature trees, just the type often used by bats. It is not possible to estimate how many roosts were lost but one can only speculate that the effect on some populations, particularly species such as noctule and Leisler's, must have been severe. A few dead or injured bats were reported in the days after the storm. It remains to be seen whether numbers recorded at feeding sites in 1988 show any marked decline. Another effect has been the loss of bat boxes though there were a number of cases of intact boxes found on fallen trees.

Summary

A total of 10 species were recorded from the L.N.H.S. area in 1987. Ninety-two new summer roosts were discovered bringing the total reported since 1950 to 522. The feeding area survey looked at 63 sites and where species identification was possible pipistrelles *Pipistrellus pipistrellus* were found to be the most abundant species. At winter sites, Daubenton's *Myotis daubentonii*, Natterer's *M. nattereri* and brown long-eared *Plecotus auritus* were most regularly recorded.

Acknowledgements

I would like to thank the London Boroughs Grants Scheme who funded the London Bat Project and the Fauna and Flora Preservation Society who provided administrative support. Thanks also go to Tony Hutson who supervised the project.

I would also like to thank the following who were involved with bat work during the year: Clive Bealey, Pat Briggs, Peter Burgess, John Dobson, Dennis Fletcher and other keepers at Highgate Wood, I. Flindall, Frank Greenaway, Mike Halpin, Tim and Sharon Harrison, Peter and Pauline Heathcote, Clive Herbert, Peter Hoffman, Mike Holmes, Tony Hutson, Peter Lewell, Dave Martin, Jim McClauchlin, S. J. Melinek, Tony Mitchell-Jones, Peter Moechnaty, Michael Parke, Richard Ranft, Paul Sowan, Joan Tait and Nigel and Nicola Watson.

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APPENDICES

APPENDIX 1. Summer roost sites in the L.N.H.S. area, 1987.

The list of bat roosts is divided firstly by species and then by county. Four-figure grid references (referring to 1-km squares) are given. For each roost a location is given and for Greater London roosts the relevant borough is also shown. The date refers to the first date of discovery of the roost.

1. DAUBENTON'S 1 roost**a. HERTFORDSHIRE 1 roost**

<i>Grid Ref.</i>	<i>Location</i>	<i>Date</i>
TQ 06 93	Rickmansworth	1987

2. PIPISTRELLE 30 roosts**a. GREATER LONDON 13 roosts**

TQ 39 91	Woodford Green, Waltham Forest	1987
40 90	South Woodford, Redbridge	1987
49 91	Romford, Havering	1987
07 85	Ickenham, Hillingdon	1987
14 82	Greenford, Ealing	1987
33 86	Stoke Newington, Hackney	1987
53 88	Hornchurch, Havering	1987
54 88	Hornchurch, Havering	1987
15 71	Teddington, Richmond	1987
50 77	Erith, Bexley	1985
17 63	Chessington, Kingston	1987
23 66	Morden, Merton	1986
26 67	Morden, Merton	1987

b. SURREY 8 roosts

TQ 08 64	Weybridge	1987
08 65	Weybridge	1987
09 61	Cobham	1987
10 65	Walton-on-Thames	1987
14 61	Oxshott	1987
08 58	Cobham	1987
32 54	Caterham	1987
36 58	Warlingham	1987

c. KENT 1 roost

TQ 46 58	Knockholt	1987
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d. ESSEX 2 roosts

TL 41 07	Roydon Hamlet	1987
TQ 61 94	Shenfield	1987

e. HERTFORDSHIRE 5 roosts

TL 27 19	Datchworth	1987
35 10	Hertford Heath	1987
12 02	St Albans	1987
37 06	Broxbourne	1987
TQ 12 93	Watford	1987

f. BUCKINGHAMSHIRE 1 roost

TQ 02 82	Iver Heath	1987
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3. LEISLER'S 1 roost**a. ESSEX 1 roost**

TQ 56 80	Aveley	1987
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4. NOCTULE 4 roosts**a. GREATER LONDON 2 roosts**

TQ 28 83	Regent's Park, Camden	1987
46 72	Sidcup, Bexley	1987

b. HERTFORDSHIRE 1 roost

TQ 07 94	Croxley Hall Wood	1987
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c. KENT 1 roost

TQ 53 72	Dartford College	1987
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<i>Grid Ref.</i>	<i>Location</i>	<i>Date</i>
5. SEROTINE 5 roosts		
a. GREATER LONDON 2 roosts		
TQ 51 88	Romford, Havering	1987
17 70	Teddington, Richmond	1987
b. KENT 1 roost		
TQ 46 58	Knockholt	1987
c. ESSEX 1 roost		
TL 47 11	Old Harlow	1983
d. HERTFORDSHIRE 1 roost		
TL 30 12	Hertfordingbury	1987
6. BROWN LONG-EARED 6 roosts		
a. SURREY 3 roosts		
TQ 10 65	Walton-on-Thames	1987
15 59	Oxshott	1987
37 50	Tandridge	1987
b. ESSEX 2 roosts		
TL 48 11	Old Harlow	1987
TQ 46 93	Chigwell Row	1987
c. HERTFORDSHIRE 1 roost		
TL 29 03	Cuffley	1987
7. UNIDENTIFIED SPECIES 45 roosts		
a. GREATER LONDON 12 roosts		
TQ 43 91	Woodford Bridge, Redbridge	1987
06 84	Hillingdon, Hillingdon	1987
51 88	Romford, Havering	1987
04 76	Longford, Hillingdon	1987
13 70	Hampton, Richmond	1987
18 74	Richmond, Richmond	1987
36 76	New Cross, Lewisham	1987
37 70	Beckenham, Bromley	1987
49 78	Upper Belvedere, Bexley	1987
36 69	Beckenham, Bromley	1987
37 66	Beckenham, Croydon	1987
47 68	St Mary Cray, Bromley	1987
b. SURREY 11 roosts		
TQ 03 69	Staines	1987
13 61	Cobham	1987
18 55	Leatherhead	1987
19 55	Headley	1987
19 58	Ashted	1987
27 55	Chipstead	1987
32 55	Caterham	1987
33 50	Bletchingley	1987
39 52	Oxted	1987
40 52	Limpsfield	1987
25 49	Reigate	1987
c. ESSEX 8 roosts		
TL 41 07	Roydon	1987
46 02	Epping	1987
47 04	Epping	1987
47 04	Epping	1987

<i>Grid Ref.</i>	<i>Location</i>	<i>Date</i>
TQ 45 94	Chigwell	1987
46 93	Chigwell Row	1987
58 90	Brentwood	1987
62 94	Brentwood	1987
d. HERTFORDSHIRE 13 roosts		
TL 06 22	Hatfield	1987
25 11	Welwyn Garden City	1987
28 10	Letty Green	1987
09 03	Watford	1987
33 04	Cheshunt	1987
35 03	Cheshunt	1987
36 07	Broxbourne	1987
37 08	Hoddesdon	1987
TQ 02 95	Chorleywood	1987
05 93	Rickmansworth	1987
07 96	Croxley Green	1987
09 98	Watford	1987
12 94	Watford	1987
e. BERKSHIRE 1 roost		
TQ 01 75	Horton	1987

APPENDIX 2. Species recorded from winter sites in 1987.

The results are arranged primarily by species and secondarily by location.

WHISKERED

<i>Location</i>	<i>Date</i>	<i>Number</i>
Kent, Westerham	13/12/87	1
Surrey, Betchworth	11/1/87	1
Surrey, Betchworth	13/3/87	1
Surrey, Betchworth	5/4/87	2
Surrey, Betchworth	11/4/87	1
Surrey, Betchworth	20/11/87	3
Surrey, Betchworth	27/12/87	1
Surrey, Box Hill	11/1/87	1
Surrey, Box Hill	1/2/87	1
Surrey, Box Hill	20/11/87	1
Surrey, Box Hill	27/12/87	1
Surrey, Brockham	3/2/87	1
Surrey, Brockham	21/3/87	1
Surrey, Brockham	20/11/87	1
Surrey, Brockham	27/12/87	1
Surrey, Godstone 2	1/2/87	2
Surrey, Godstone 2	12/12/87	1
Surrey, Godstone 2	2/1/87	1
Surrey, Godstone 3	15/3/87	1
Surrey, West Humble	18/1/87	1
Surrey, West Humble	22/2/87	1

BRANDT'S

Kent, Westerham	25/1/87	2
Kent, Westerham	28/2/87	1
Kent, Westerham	13/12/87	3

WHISKERED/BRANDT'S

Kent, Darenth	17/1/87	1
Kent, Westerham	25/1/87	4
Kent, Westerham	28/2/87	4
Kent, Westerham	13/12/87	1
Surrey, Betchworth	11/1/87	1

<i>Location</i>	<i>Date</i>	<i>Number</i> •
Surrey, Betchworth	13/3/87	1
Surrey, Betchworth	27/12/87	1
Surrey, Box Hill	22/2/87	1
Surrey, Box Hill	15/3/87	3
Surrey, Box Hill	27/12/87	1
Surrey, Godstone 1	1/2/87	1
Surrey, West Humble	18/1/87	1

NATTERER'S

Essex, Grays 1	1/87	5
Essex, Grays 1	2/87	14
Essex, Grays 2	2/87	1
Kent, Darenth	19/3/87	1
Kent, Westerham	25/1/87	13
Kent, Westerham	28/2/87	8
Kent, Westerham	13/12/87	11
London, Bromley 1	19/12/87	2
Surrey, Betchworth	11/1/87	1
Surrey, Betchworth	18/2/87	1
Surrey, Betchworth	13/3/87	1
Surrey, Betchworth	5/4/87	1
Surrey, Betchworth	20/11/87	1
Surrey, Betchworth	27/12/87	1
Surrey, Box Hill	20/11/87	1
Surrey, Brockham	11/1/87	1
Surrey, Brockham	21/3/87	1
Surrey, Godstone 1	1/2/87	3
Surrey, Godstone 1	15/3/87	1
Surrey, Godstone 1	12/12/87	1
Surrey, Godstone 2	2/1/87	1
Surrey, Godstone 2	1/2/87	2
Surrey, Godstone 2	12/12/87	1
Surrey, Godstone 3	1/2/87	1
Surrey, Godstone 3	15/3/87	1
Surrey, Godstone 4	1/2/87	2
Surrey, West Humble	18/1/87	8
Surrey, West Humble	22/2/87	12
Surrey, West Humble	21/3/87	5
Surrey, West Humble	27/12/87	9

DAUBENTON'S

Essex, Grays 1	1/87	12
Essex, Grays 1	2/87	12
Essex, Grays 2	2/87	1
Kent, Darenth	17/1/87	2
Kent, Darenth	13/12/87	3
Kent, Westerham	25/1/87	9
Kent, Westerham	28/2/87	16
Kent, Westerham	13/12/87	9
London, Pratts Bottom	11/1/87	1
Surrey, Betchworth	18/2/87	1
Surrey, Betchworth	13/3/87	1
Surrey, Betchworth	5/4/87	1
Surrey, Box Hill	27/12/87	1
Surrey, Godstone 1	1/2/87	1
Surrey, Godstone 1	12/12/87	1
Surrey, Godstone 2	2/1/87	3
Surrey, Godstone 2	1/2/87	1
Surrey, Godstone 2	15/3/87	5
Surrey, Godstone 2	12/12/87	2
Surrey, Godstone 3	2/1/87	1

<i>Location</i>	<i>Date</i>	<i>Number</i>
Surrey, Godstone 3	15/3/87	1
Surrey, Godstone 3	12/12/87	1
Surrey, Godstone 4	2/1/87	2
Surrey, Godstone 4	1/2/87	3
Surrey, Godstone 4	15/3/87	1
Surrey, Godstone 5	1/2/87	1
Surrey, Merstham 8	22/2/87	1
Surrey, West Humble	18/1/87	6
Surrey, West Humble	22/2/87	3
Surrey, West Humble	21/3/87	3
Surrey, West Humble	27/12/87	1

NORTHERN BAT

Surrey, Betchworth	11/1/87	1
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BROWN LONG-EARED

Essex, Grays 1	1/87	1
Essex, Grays 1	2/87	2
Kent, Darenth	17/1/87	2
Kent, Darenth	13/12/87	1
Kent, Westerham	25/1/87	5
Kent, Westerham	28/2/87	1
Kent, Westerham	13/12/87	1
London, Chalk Wood	17/1/87	6
London, Pratts Bottom	19/12/87	5
Surrey, Betchworth	11/1/87	1
Surrey, Betchworth	3/2/87	1
Surrey, Betchworth	20/11/87	2
Surrey, Box Hill	20/11/87	1
Surrey, Brockham	11/1/87	2
Surrey, Brockham	3/2/87	1
Surrey, Godstone 2	2/1/87	1
Surrey, Godstone 5	1/2/87	1
Surrey, West Humble	18/1/87	1
Surrey, West Humble	22/2/87	1
Surrey, West Humble	20/11/87	1
Surrey, West Humble	27/12/87	1

APPENDIX 3. Results of feeding area survey, 1987

A 'site' is considered to be an area within a 1-km National Grid square. Thus one 1-km square may contain several 'sites' and a large area such as Hampstead Heath, which covers several 1-km squares, is considered to be made up of several 'sites'.

For the Greater London area sites are divided primarily by borough and secondarily by grid reference. The dates of visits, the maximum number seen on any one visit and the species found are also shown.

All positive identifications of species are based on using bat detectors coupled with flight observations. Noctule and Leisler's bats are not separated in the table since their calls are very similar on bat detectors.

KEY: Maximum number seen: a = 1 to 5 bats
b = 6 to 20 bats
c = 20+ bats

Species: P = Pipistrelle bats
N = *Nyctalus* species (Noctule or Leisler's bats)
D = Daubenton's bats
U = Unidentified species

GREATER LONDON AREA**1. BARNET**

<i>Grid Ref.</i>	<i>Location</i>	<i>No. of Visits</i>	<i>Max. No. Seen</i>	<i>Species</i>
TQ 21 90	Graeme Park Pond	1	a	N
24 93	Darlands Lake	1	b	N, P
25 95	Greenhill Park Lake	1	b	N, P
27 96	Beech Hill Lake	1	b	N, P, D
26 87	Hampstead Heath Extension	1	a	P

2. BEXLEY

TQ 50 80	Belvedere Industrial Estate	1	a	U
46 72	River Shuttle	1	a	U
46 73	Lamorbey Park	2	a	N, P
47 73	Bexley, Penhill Road	1	a	U
48 71	River Cray	1	a	P
48 72	River Cray	1	a	P

3. BROMLEY

TQ 41 70	Sundridge Park	2	b	N, P, U
37 69	Beckenham, The Avenue	1	a	P
41 66	Hayes Trout Fishery	8	c	N, P

4. CROYDON

TQ 31 70	Upper Norwood, Beulah Hill	1	a	U
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5. HACKNEY

TQ 32 87	Stoke Newington Reservoirs	1	a	P
33 86	Abney Park Cemetery	1	—	U

6. HARINGEY

TQ 28 88	Highgate Wood	3	a	N, P
30 88	Stroud Green, Granville Road	1	b	N, P

7. HAVERING

TQ 51 88	Romford, Western Road	1	a	P
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8. HILLINGDON

TQ 04 91	River Colne	1	—	D
04 89	Mount Pleasant	1	—	N, D
04 89	River Colne	1	a	P, D
04 89	Grand Union Canal	1	—	P
05 89	Harefield	1	—	N, P
07 85	Ickenham, Milton Road	1	a	P

9. HOUNSLOW

TQ 20 76	Chiswick, Thames Village	1	a	U
20 78	Gunnrsbury Triangle	1	a	P

10. LAMBETH

TQ 32 75	Ruskin Park	1	a	U
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11. MERTON

TQ 22 72	Wimbledon Common	1	b	N, P, D
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12. NEWHAM

TQ 41 85	Wanstead Flats	1	b	N, P, D
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13. RICHMOND-UPON-THAMES

TQ 17 70	Normansfield Hospital	1	a	P, U
17 73	River Thames	1	a	P
17 73	River Thames	1	b	N, P

14. SOUTHWARK

TQ 33 79	Butlers Wharf	1	a	U
34 74	Peckham Rye Park	1	a	P
34 75	Peckham Rye Park	1	a	P

<i>Grid Ref.</i>	<i>Location</i>	<i>No. of Visits</i>	<i>Max. No. Seen</i>	<i>Species</i>
15. SUTTON				
TQ 29 65	Beddington Park	1	a	N, P
16. TOWER HAMLETS				
TQ 35 83	Hertford Union Canal	1	a	P
36 83	Hertford Union Canal	1	a	P
37 84	Victoria Park	1	a	N, P
17. WALTHAM FOREST				
TQ 35 86	Walthamstow Marsh	1	b	N
HERTFORDSHIRE				
TQ 04 93	Stockers Lake	1	—	N, P
05 93	River Colne	1	—	N
06 93	Batchworth	1	—	D
06 94	Batchworth	1	—	D
07 94	Croxley Hall Wood	1	a	P
08 95	Croxley Green	1	—	P
20 96	Borehamwood, Maxwell Park	1	a	U
KENT				
TQ 53 72	Dartford College	1	a	N
ESSEX				
TQ 58 78	West Thurrock	1	a	N
SURREY				
TQ 19 54	Nower Wood Pond	1	—	P, D

APPENDIX 4. Miscellaneous bat records for 1987.

The results are arranged primarily by species and secondarily by grid reference.

DAUBENTON'S

<i>Grid Ref.</i>	<i>Borough/ County</i>	<i>Location</i>	<i>Date</i>	<i>Number</i>
TQ 31 53	Surrey	Merstham	3/5/87	5
31 53	Surrey	Merstham	3/11/87	2

PIPISTRELLE

TL 45 02	Essex	Epping, Epping High Street	12/12/87	1
TQ 03 94	Hertfordshire	Rickmansworth, Mill Way	—	1
25 87	Barnet	Hampstead, Heath Close	13/1/87	1
26 87	Barnet	Hampstead Heath	10/7/87	1
28 83	Camden	Camden, Albert Street	25/2/87	1
29 81	Camden	Tottenham Court Road	20/3/87	1
47 80	Greenwich	Thamesmead, Owen Close	13/3/87	1
56 80	Essex	Aveley	17/12/87	1
31 77	Lambeth	Kennington, St Agnes Place	7/8/87	1
47 77	Bexley	Abbey Wood, West Heath Road	29/6/87	1
18 66	Kingston	Surbiton	21/3/87	1
22 66	Sutton	Worcester Park, Cheam Common Road	13/2/87	1
18 69	Kingston	Kingston	13/2/87	1
36 61	Croydon	Croydon, Court Wood Lane	6/7/87	1

NOCTULE

TQ 28 83	Camden	Regent's Park, London Zoo	10/87	1
24 76	Hammersmith	Parsons Green	20/3/87	1
41 78	Greenwich	Charlton	16/10/87	1
28 59	Croydon	Coulsdon, Nutfield Road	30/10/87	1

Grid Ref.	Borough/ County	Location	Date	Number
BROWN LONG-EARED				
TQ 07 96	Hertfordshire	Croxley Green, The Grove	—	1
10 98	Hertfordshire	Watford	—	1
11 99	Hertfordshire	Watford	—	1
12 80	Ealing	Southall	7/9/87	1
16 76	Hounslow	Syon Park	4/9/87	1

Book Review

I Remember. By Valezina Bolingbroke (née Frohawk). Feather Books, Shrewsbury. 1988. 44pp. ISBN 0 947718 10 9. Copies signed by the author, are available at £2.50 (including postage) from: Valezina, Viscountess Bolingbroke, 10 The Cloisters, Steeple Drive, Alton, Hampshire GU34 1TW.

This booklet is a collection of memories charmingly written by Valezina, Viscountess Bolingbroke, the youngest daughter of the naturalist and illustrator F. W. Frohawk who is best known for his work on butterflies. It concentrates on the places and people remembered by Valezina: these include recollections of Surrey, Norfolk, Suffolk, Essex, London, north Kent, West Sussex, Hampshire and the New Forest, Dorset, Gloucestershire and Galloway.

Valezina was brought up in a house steeped in natural history, for her father worked at home illustrating, writing and editing for *The Field*. The whole family were keen on the countryside, enjoying many long walks in pursuit of natural history. This book gives an intimate view of her naturalist father and as such will be of interest to naturalists and especially lepidopterists.

It was another common family interest – music – that formed the centre of Valezina's own life as a solo cellist, performing at concerts and teaching her pupils. She herself received lessons from the world famous cellist Madame Suggia, a remarkable person whom Valezina recalls in her memoir.

K. H. HYATT

Botanical Records for 1987

by RODNEY M. BURTON*

Summary

This paper presents a selection of the most interesting plant records made in the London area in 1987 by members of the London Natural History Society and others. They include the hybrid *Artemisia verlotiorum* × *vulgaris*, new to science, the hybrids *Prunus domestica* × *spinosa*, *Rubus caesius* × *idaeus*, *Rorippa amphibia* × *austriaca*, *Fallopia aubertii* × *Reynoutria japonica*, *Myosotis caespitosa* × *palustris* and *Equisetum fluviatile* × *palustre*, new or at least very seldom previously recorded in the London area or in some cases even in Britain, and a substantial population of *Arabis* (*Turritis*) *glabra*.

Introduction

Many will remember 1987 for its unusual weather. Early in the year there was exceptional snowfall; during the summer there was a great deal of rain; and in the early hours of October 16th there were extraordinary gusts of wind which blew down many trees and put a stop to all movement except in the more densely built-up and so less treed parts of the London area.

Only the last of these events will have any lasting effect on the flora. Woods which have been most completely changed in character are those on steep slopes where the trees are more easily toppled. South of London where most of the wooded steep slopes are hangers on the chalk, the trees were beeches *Fagus sylvatica* which in any case are shallow-rooted and therefore vulnerable; these trees are nearly all down and the saplings which are waiting to replace them are sycamore *Acer pseudoplatanus* and ash *Fraxinus excelsior*. On other strata no trees were immune, but the most numerous casualties were birches *Betula* spp. which will eventually be replaced by more birches if woods are left to regenerate naturally. The shade of the fallen trees, especially the beeches, will soon be missed. Opportunist plants, such as willow-herbs *Epilobium* spp., will increase at the expense of such plants as the bird's-nest orchid *Neottia nidus-avis*, already in decline in the London area, which can only grow under beeches and similar trees. Outside woods the storm has had a profound effect on the landscape in many places, but the effect on the flora will be slighter. One species which can be expected to suffer a reduction in numbers is mistletoe *Viscum album*. The presence of mistletoe on a tree will have increased its resistance to the wind and therefore the likelihood of the tree being blown over. I knew of four isolated trees bearing mistletoe in this neighbourhood. The storm has removed three of them but has created a view of a fifth of which I was previously unaware. In all these cases it is likely that *Viscum* had been deliberately introduced. Members who feel that some of the above remarks are speculative are invited to let me have their own observations of the effects of the hurricane, even on common species, as soon as they think those effects can be observed.

The most memorable feature of the botanical records for 1987 will certainly be the wealth of unexpected hybrids. Hybrids mentioned in the following paragraphs include some which are new to the London area, new to Britain or even new to science. The arrangement of these paragraphs is as in previous reports here, dividing the area within 32 km of St Paul's Cathedral first in Watsonian vice-counties, and then in each vice-county placing first those records occurring in any of the London boroughs.

V.C. 16, West Kent

The best list of plants received was Joyce Pitt's, and her plants from the London Borough of Bromley deserve a paragraph to themselves. Taking advantage of an

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open day to visit the private grounds of Holwood Park, she was rewarded by the rare sedges *Carex pallescens*, *C. nigra* and *Scirpus setaceus* in a boggy flush and rare clovers *Trifolium subterraneum* and *T. striatum* and upright chickweed *Moenchia erecta* on earthworks. In garden turf there was a lot of adder's-tongue *Ophioglossum vulgatum* and some stemless thistle *Cirsium acaulon*. On the bank of the Ravensbourne in Barnet Wood Mrs Pitt found some hard fern *Blechnum spicant*, perhaps half a mile further north than the plant on Keston Common previously considered very isolated. In the cockpit on Chislehurst Common there were good grasses *Koeleria cristata*, *Helictotrichon pubescens* and a very glaucous-leaved *Festuca ovina*. Sundridge Park golf course produced an unexpected colony of the decreasing St John's-wort *Hypericum montanum*, previously known from near Elmstead Woods Station not far away, and by an old pond near the house in Scadbury Park there was the rare willow *Salix purpurea*; like other isolated trees of this species there must be suspicion of it having been originally planted. At High Elms there was water chickweed *Myosoton aquaticum* in the very dry surroundings of a new beech plantation. On an Orpington Field Club excursion a plant of the corky-fruited water-dropwort *Oenanthe pimpinelloides* turned up in Pett's Wood near the railway; perhaps this had been carried as seed on a boot from Jubilee Park not far away.

Still in London Boroughs, it is hard to imagine that G. D. Kitchener could find more salt-marsh plants by the side of main roads, where spray from surfaces treated with salt in snowy conditions creates a narrow band of suitable habitat, to cap those mentioned here in previous years, but in 1987 he found a group of five plants of the sea-spurrey *Spergularia marina* by the A21 near Farnborough. At the time of writing, the 1987/88 winter has produced very little snow but a great deal of fresh water, so I doubt whether this and other short-lived plants found in such situations will re-appear in 1988. Not far away in a wood near Pratt's Bottom Mr Kitchener found a colony of a St John's-wort *Hypericum maculatum* which was virtually unknown so close to London in Kent, though there are few records from similar situations at the edge of the Chalk in Surrey. Still in the London Borough of Bromley, I found a colony of the rare poppy *Papaver lecoqii* on top of a wall much visited by botanists looking for the very much rarer plant *Galium parisiense*, so it cannot have been there long, and at the north tip of Jubilee Park our meeting of 26th June found uncommon clovers *Trifolium striatum* and *T. arvense* in small quantity in a site well known for another rarity already mentioned.

Outside Greater London, Mrs Pitt found the broad-leaved spurge *Euphorbia platyphyllos* in an arable field near Westerham Wood. Mr Kitchener's roadside halophytes included a plant of the grass *Catapodium maritimum* on the central reservation of the new A2 where it crosses Dartford Heath. By the A225 south of Eynsford I found a plant of sea aster *Aster tripolium* in a similar salt-sprayed situation. The first hybrid to be mentioned is the intergeneric orchid hybrid *Dactylorhiza fuchsii* × *Gymnadenia conopsea* which Mr Kitchener found near Shoreham; there is an earlier record of this in the same area about 30 years ago. He also spotted *Epilobium adenocaulon* × *montanum* and *Rumex obtusifolius* × *sanguineus*, less uncommon crosses but still needing a keen eye, the willow-herb on a tip east of Swanscombe and the dock on the river-bank at Shoreham. Our joint meeting with other societies on July 4th revealed a new site for fiddle dock *R. pulcher* near the same river at Horton Kirby; participants sat next to it for their picnic lunch.

V.C. 17, Surrey

Another plant of the spotted/fragrant orchid cross *Dactylorhiza fuchsii* × *Gymnadenia conopsea* was reported from a site in the London Borough of Croydon by Mrs P. M. Dawe. Like the Kent one, this is very probably the same individual that has been known in the area at intervals over quite a long time. One

orchid colony which has very definitely not reappeared is the bee orchids *Ophrys apifera* reported in 1985 from a former railway property near Herne Hill; the site was bulldozed later that year by its owner, who was concerned that attention being paid to the wildlife value of the site would scotch his plans to build on it. Eventually permission for his plans was refused anyway and vegetation has recovered well; J. E. Harvey reported to me that the eyebright *Euphrasia* sp. which had also been there in 1985 was again common in 1987. At another place a mile away Mr Harvey found seedlings of black walnut *Juglans regia* near the parent tree, with good evidence that the activities of grey squirrels had been involved in their germination. Finally in this paragraph, the continued activity of R. B. Hastings in well-botanised localities must be mentioned, because in Kew Gardens he found rosy garlic *Allium roseum* well naturalised in grassland and the bristly hawkbeard *Crepis setosa* below tit-feeders, a clear indication that this species can be introduced in bird-seed, and from Ham River Lands he supplied details of the populations of the grasses *Bromus erectus* and *Koeleria cristata*, species which in downland would be unremarkable but which here are interesting relics of the natural vegetation of the Thames flood-plain.

Similar relics are the clustered bellflower *Campanula glomerata* which a meeting of our South-west Middlesex section found on Desborough Island further up-river, beyond the boundary of the outermost London boroughs, and B. M. Spooner's meadow saxifrage *Saxifraga granulata* in Elmbridge Cemetery, West Molesey. Other good records from the outer Surrey part of our area are the sedges which D. Stubbs found in Princes Coverts in the course of an investigation commissioned from him; in the southern part there was *Carex pallescens* in a damp shady ride, and further north *C. demissa* on a more open, grassy ride. On Laleham Burway golf-course, another Thames flood-plain site, Lady Rosemary Fitzgerald and others found field mouse-ear chickweed *Cerastium arvense* and knotted bur-parsley *Torilis nodosa* and on the steep slope of Colley Hill they re-discovered the least bedstraw *Galium pumilum* last seen here by Lousley in 1942. J. Dews sent me a specimen of *Brunnera macrophylla*, a garden-escape with flowers like forget-me-nots but much broader leaves, from a railway-side path near Redhill. Mrs J. F. Leslie and others found the sloe-plum hybrid *Prunus* × *fruticans* at Long Ditton and in two places near West Ewell and the same and a raspberry-dewberry hybrid *Rubus* × *idaeoides* in hedgerows at East Molesey. Our only previous record of the *Prunus* hybrid is of a patch at Crockenhill, v.c. 16, found by J. R. Palmer in 1985; the *Rubus* hybrid has one old record from near Shepperton, v.c. 21, and was found by Dr A. C. Leslie on Bookham Common in 1982 (Radcliffe 1984). However it is likely that both are overlooked.

V.C. 18, South Essex

Walthamstow is on the Essex side of the boundary in the lower Lea valley, so one of two clumps of the new hybrid *Artemisia verlotiorum* × *vulgaris*, discovered, as hybrids so often are, by Brian Wurzell, has this paragraph to itself. The criteria by which this plant could be identified as intermediate between the two parent species are impeccable. Mugwort *A. vulgaris*, the commoner parent, has usually finished flowering before the other starts, but sometimes flowers later, for instance after plants have been damaged. Chinese mugwort *A. verlotiorum*, which flowers in November, weather permitting, is a locally abundant alien in several parts of the London area and elsewhere. Unusually among the Compositae, these plants are pollinated by the wind. There is a fair chance that the hybrid occurs and has gone unnoticed outside the Lea valley, but at the time of writing no other records of it have been traced and it has no name.

Only just before it flows into its first London borough the river Roding passes a well-known colony of the naturalised alien *Rorippa austriaca*. Here, with T. C. G. Rich, an expert in this genus and other yellow-flowered Cruciferae, Mr Wurzell found yet another new hybrid, the other parent of which is the native species *R. amphibia*. The other South Essex record to be mentioned is Mr Kitchener's

solitary sea-aster *Aster tripolium* by a slip-road of the M25 at its junction near Upminster.

V.C. 19, North Essex

Another riverside site, the bank of the Cornmill Stream near Waltham Abbey, is where D. Bevan and Mr Wurzell found the first hybrid recorded from the London area between the two common water forget-me-not species, which has the name *Myosotis* $\times$ *suzae*. The site has been well worked botanically, and though it may not be surprising that this hybrid between two fairly similar species has been missed, the rare aquatic umbellifer *Apium inundatum* which they discovered nearby in marshy hollows is reasonably distinctive.

V.C. 20, Hertfordshire

The part of this vice-county which is within the London Borough of Barnet includes a field in the Dollis Valley where D. Griffith and A. Vaughan independently found saw-wort *Serratula tinctoria* within a few days of each other. It had not been seen there for about 20 years and was feared extinct. Dr Griffith reported seven flowering stems, two of them with white flowers, Mr Vaughan about 30 plants, only 12 of them in flower. The habitat is damp meadow with pepper-saxifrage *Silaum silaus*, ragged robin *Lychnis flos-cuculi* and other species which are declining nationally as more and more of the places which suit them are altered by one form or another of development. In Totteridge Fields generally Mr Vaughan reports that hybrids with some five-petalled flowers are more frequent than the true four-petalled species of tormentil *Potentilla erecta*. Other plants for which he has supplied very useful details are the uncommon sedges *Carex nigra* and *C. panicea* and grasses *Bromus racemosus* and *Glyceria declinata*, all expertly determined.

Investigating the recent history of *Serratula tinctoria* north of London, I learned that in 1984 T. J. James found non-flowering material of it in a pasture at Brookmans Park, together with blinks *Montia fontana* and heath violet *Viola canina*. Many grasslands of various types all round London have been very much overgrazed by horses in recent years, and will be worth investigating in any year when grazing has ceased.

Another hybrid not previously recorded from the London area is the cross between the field and marsh horsetails, *Equisetum* $\times$ *rothmaleri*. This was near our northern boundary in wet mud by a gravel-pit at Great Amwell, a suitable habitat for the sexual generation of horsetails and so for the occurrence of hybrids. By a path in this area Mr Bevan also found a willow-herb of rare occurrence in our part of the country, *Epilobium lanceolatum*. Also he led our meeting of 13th June in the Lea Valley north of Cheshunt, which found the pondweed *Potamogeton trichoides* in a recently flooded gravel-pit west of Aqueduct Lock, *Bromus commutatus*, the rough hawksbeard *Crepis biennis* and blue fleabane *Erigeron acer* in the Cowslip Meadow and on disturbed ground further south *Rorippa austriaca* and an abundance of salsify *Tragopogon porrifolius*. In the afternoon of that day I looked at the length of New River north of Cheshunt and was able to extend by a mile or so the range in this artificial waterway of the rarity *Oenanthe fluviatilis*, mentioned at greater length in last year's report. The neighbourhood of the M1 motorway near Aldenham received a lot of attention as part of the activity related to the Botanical Society of the British Isles' monitoring scheme. G. P. Smith found two plants of bee orchid *Ophrys apifera* in disturbed grassland in Berrygrove Wood; in the same area T. J. James and Mr Smith found two clumps of the seldom naturalised alien vetch *Lathyrus tuberosus*, not near each other; the same two found a bush of *Rosa stylosa* in a gravel pit near Well Hall; and A. D. Marshall found the sedge *Carex demissa* at the edge of the Wood. Rarities found in another part of the county by Mrs A. M. Boucher are the meadow saxifrage *Saxifraga granulata* on a verge near Ashedene, an alien crucifer *Erucastrum gallicum* on a pavement in Cuffley and a rare or perhaps often overlooked goosefoot *Chenopodium strictum* on a dunghill

by the A414 west of Hertford. This place also produced bird-seed aliens, of which one might be the flower-of-a-day *Hibiscus trionum* which Mrs Boucher told me had been found there by C. G. Hanson. P. J. Ellison's interesting list included a number of plants in the Rickmansworth area, among them water whorl-grass *Catabrosa aquatica* in the River Chess, petty whin *Genista anglica* on Croxley Green and tree mallow *Lavatera arborea* and pale toadflax *Linaria repens* as aliens on waste ground.

V.C. 21, Middlesex

First must be mentioned the Middlesex plant of the hybrid *Artemisia verlotiorum* × *vulgaris*, already mentioned under v.c. 18. Mr Wurzell found this one near Northumberland Park Station. Even more remarkable is the hybrid between Japanese knotweed and Russian vine, discovered by Mr Bevan at Railway Fields, Haringay. This is not quite new to science, having previously been produced artificially by J. P. Bailey, who confirmed the identification, but it is the first time the hybrid has been detected as a natural occurrence. It is not only international but also intergeneric; the parent species, both originally described in the widely circumscribed genus *Polygonum*, are now considered to be correctly called *Reynoutria japonica* and *Fallopia aubertii* respectively. The same site had a stand of the uncommon though invasive grass *Calamagrostis epigejos* and plants of the pretty alien vetch *Vicia villosa*.

So many good records were made in the v.c. 21 part of Greater London in 1987 that it is hard to decide which to mention next. Before leaving Mr Wurzell I should mention his discovery of *Saxifraga tridactylites* on an old wall at Enfield; this is a long way from its nearest surviving locality previously known, at Cheshunt. Several interesting finds were reported to me by D. H. Kent, the B.S.B.I.'s recorder for v.c. 21, including P. J. Edwards's mountain fern *Oreopteris limbosperma*, two small plants at the Hermitage, Church Road, Hanwell, fiddle dock *Rumex pulcher*, one small plant by Barons Pond, Acton and musk thistle *Carduus nutans* by the River Brent near Southall; P. J. Cribb's small colony of bee orchid *Ophrys apifera* on Hounslow Heath and spotted orchid *Dactylorhiza fuchsii* on a garden lawn at Feltham; his own abundant marsh dock *Rumex palustris* on the Isle of Dogs; and the marjoram *Origanum vulgare* he found on the river-wall at Hampton Court in the company of Mrs J. E. Smith. The latter was found in the course of surveying for the B.S.B.I. monitoring scheme already mentioned. This was also how tower mustard *Arabis glabra* came to be found in the London area for the first time this century, by B. M. Spooner at Stain Hill Reservoirs, Hampton, an area which has not often been accessible to botanists. Hundreds of plants of it on the reservoir bank above the water line were a spectacle probably unique in this country. Mr Kent has kindly pointed out to me that there is an older record from the same area 'between Hampton Wick and Sunbury' in the form of a marginal annotation by Alexander Irvine in an interleaved copy of Trimen and Dyer (1869), preserved in the Botany Library of the British Museum (Natural History). It was also how Mrs E. Norman came to find in Bushy Park the hybrids *Potentilla anglica* × *erecta* and *Juncus acutiflorus* × *articulatus* and the grass *Koeleria macrantha*, and in Hampton Court Park more *Koeleria* and also a population of *Bromus lepidus*. One of the aims of this scheme is to get details of the populations of the less common species in a sample of sites throughout the British Isles into a form in which it will be possible to compare their present state with what they will be like in future at intervals of say 25 years.

As usual, there are some unexpected records from heavily built-up parts of the area. J. E. Harvey found a flourishing plant of *Astrantia major* in the grounds of the Toffee Park Youth Club on the northern border of the City, which was probably planted originally, but so long ago that the present occupants of the site know nothing about it. Nearby in a derelict churchyard in Ironmonger Row there was a self-sown seedling of field maple *Acer campestre*, which is a rare sight in comparison to the abundant seedlings near any mature tree of its relative the

sycamore *A. pseudoplatanus*. By the railway outside Paddington where it passes in front of Wormwood Scrubs, I was given the opportunity of confirming the records made in 1984 by Mr Edwards, S. McAndrews and others of the spiny variety of common rest-harrow *Ononis repens* var. *horrida* and also found an old tree of the alien willow *Salix daphnoides* and large numbers of a hawkweed *Hieracium umbellatum* and other hawkweeds less uncommon in inner London. On another railway site near Halsbury Road at the northern boundary of Ealing, in the course of a survey commissioned by that borough, Mr McAndrews found hairy St John's-wort *Hypericum hirsutum* and hemp agrimony *Eupatorium cannabinum*, both good plants for such a locality. In west London J. B. Latham found bur chervil *Anthriscus caucalis* by a street tree in Dukes Avenue W4, perhaps from bird-seed, soft clover *Trifolium striatum* on one grave in St Mary's R.C. cemetery and *Allium paradoxum* naturalised in the adjacent Kensal Green Cemetery. In central Wembley, a puddle formed in a cracked pavement noticed by L. R. Williams had been there long enough to develop a population of duckweed *Lemna minor*. He also sent me a list of 51 plants from Fryent Country Park not mentioned in his recent paper (Williams 1986), but 42 of them are weeds present in ground which had been disturbed by an unwelcome horde of travellers who had plagued the site.

A similar supplementary list is the one from Dr D. Griffith referring to her paper (Griffith 1986); most of the plants are casuals from ground disturbed in the construction of the car-park of Payless D-I-Y (a *nomen ineptum*), most notably treacle mustard *Erysimum cheiranthoides* and tumbling mustard *Sisymbrium altissimum*. Also in the far north of Middlesex, Mr Vaughan had identified for him by Dr R. D. Meikle a plant of *Salix purpurea* $\times$ *viminialis* in the south-east part of Scratch Wood Open Space (there is a probably planted *S. purpurea* on a roadside embankment about 500 yards away which might be one parent) and in school grounds at Mill Hill *S. nigricans* (correctly called *S. myrsinifolia*) which is not native in south England, so must be assumed to have been planted or to be descended from planted stock. I was able to match his specimen of a roadside *Hieracium rigens* with one identified for me by the late Dr C. West. At the north-eastern corner of Harrow Weald Common a substantial population of the heath rush *Juncus squarrosus*, which is a rare native plant in the London area, and by a small pond the slightly less rare bulbous rush *J. bulbosus* were found in the course of preparation of a nature conservation strategy for the Borough of Harrow, to be published in 1988 by the Greater London Ecology Unit.

The best 1987 records from that part of v.c. 21 which is now in Surrey are those made by Lady Rosemary Fitzgerald and others across the bridge from Chertsey. They refound meadow-rue *Thalictrum flavum* which has become a rare plant in the London area in the last thirty years, and discovered *Alopecurus* $\times$ *hybridus*, the cross between the common and marsh foxtails, found only once in Middlesex before. On Staines Moor P. J. Cribb found spotted orchid *Dactylorhiza fuchsii*, which remarkably does not seem to have been seen in this well botanised locality before. These records are among those communicated to me by D. H. Kent.

V.C. 24, Buckinghamshire

No 1987 records have been received from the small part of this vice-county within 32 km of St Paul's Cathedral, but in 1986 near Wraysbury J. M. Mullin collected the rare dock hybrid *Rumex hydrolapatium* $\times$ *obtusifolius*, confirmed by J. Akeroyd and Mr Kent.

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Obituaries

ERIC HERBERT WARMINGTON, M.A., F.R.HIST.S., 1898-1987



From an oil painting in Birkbeck College.

Professor E. H. Warmington, who died on 8 June 1987 at the age of 89, was a distinguished classical scholar, a man of singular humanity and wit and an Honorary Vice-President of the L.N.H.S.

He joined the Society in 1948 and it is mainly as an ornithologist that we remember him. He sent in masses of records of his observations, always filling his numerous record sheets, including the margins, with amusing detail. He had a delightful sense of humour. His records were from a wide area north of the Thames – from Mill Hill (where he lived and where he led most informative field meetings), Stanmore, Harrow Weald, Old Parkbury and Moor Mill Gravel Pits and from Inner London – Bloomsbury, Lincoln's Inn Fields, Fetter Lane, the City bombed sites and, of course, Regent's Park where he was the official observer for many years. He later became a member of the Committee on Bird Sanctuaries in the Royal Parks. He contributed to the Gravel Pits Survey which was published in the *London Bird Report* 17 (1953). During the tit irruption of 1949 he followed a movement of long-tailed tits across Inner London by bus and on foot (*L.B.R.* 14, 1950). He was also one of the first people to note the autumn passage of chaffinches and other species over central London. He was a very musical man and had a remarkable ear for bird song and that was why Tom Bartlett enlisted his help with courses held at Battle of Britain House, Ruislip, where students were introduced to the dawn chorus.

Eric Warmington was born on the 15 March 1898, the son of John Herbert Warmington, M.A. and Maud Lockhart. He was educated at the Perse School,

Cambridge and at Peterhouse, which he joined after his service from 1917 to 1919 in the Royal Garrison Artillery and in the King's Own Yorkshire Light Infantry. At the beginning of the 'Troubles' in Ireland he was stationed in Co. Cork and it was here that he met his future wife Marian 'Molly' Eveline Robertson whom he married in 1922. At Peterhouse he graduated in classics and after teaching at Charterhouse and Mill Hill School he joined the staff of King's College, London as Reader in Classics in 1925. Elected a Fellow of the Royal Historical Society in 1928 he went to Birkbeck College as Professor of Classics in 1935, remaining there until his retirement 30 years later.

The titles of his books bear witness to his special interests and they covered such topics as *The Commerce Between the Roman Empire and India*, *The Ancient Explorers*, *Greek Geography*, *Athens*, and four volumes of *Remains of Old Latin* in the Loeb Classical Library of which he was editor from 1937 to 1954. He also wrote numerous articles and a chapter in the *Cambridge History of the British Empire*, whilst in 1954 he produced a *History of Birkbeck College During the Second World War*.

Professor Warmington held numerous university posts and from 1963 to 1966 was President of the London Branch of the Classical Association. For 10 years he was a Vice-Master of Birkbeck and on two occasions he officiated as acting Master on the deaths of the then masters. He took a keen interest in the musical life of the College and his colleagues were constantly reminded of his affectionate and scholarly interest in birds and gardening. He would break off in the middle of a lecture to look at the black redstarts that were visible from his windows in Fetter Lane. On his retirement his college honoured him by making him a Fellow and Vice-President.

He is survived by his wife together with their son and two daughters.

K. H. HYATT and W. G. TEAGLE

HILDA MARGARET SMITH, 1909-1988

It was with great regret and sadness that we learned of the death of Miss H. M. Smith in February.

Margaret will be sorely missed, not only because of the work she did on the L.N.H.S. Council and for the South-West Middlesex Section, but also for the qualities of loyalty, friendship and dedication which marked all aspects of her life.

She became a committee member of the South-West Middlesex section in 1956, when she took on the role of Assistant Secretary, and was elected to the post of Secretary in 1966, a position she still held at the time of her death, thus recording an unbroken run of 32 years as a committee member.

Margaret achieved the same meticulously high standards in her career as a Higher Executive Officer in the Civil Service, as in her work for the Church, and in her flower arranging and other activities. A further dimension to her character was the encouragement of young peoples' interest in natural history, particularly in botany, where she was a skilled observer and recorder.

The Society has lost a competent administrator, the South-West Middlesex Section an excellent and respected Secretary and her fellow members a good, much loved and quite often forthright friend.

A. J. LEPPARD

STANLEY CRAMP, O.B.E., B.A., F.Z.S., M.B.O.U., 1913-1987

Stanley Cramp, who died on 20 August 1987, had been a member of the L.N.H.S. since 1942. He was a Council member from 1957 to 1959, Chairman of the Ornithological Section in 1957 and 1958, a Vice-President from 1960 to 1976, and an Honorary Vice-President at the time of his death. Stanley was born in Cheshire on 24 September 1913, and after taking a B.A. degree at Manchester University he went into Customs and Excise, remaining with that Department until 1970. He took early retirement to become a professional ornithologist after many years as a very distinguished amateur in the true sense of that word, and he will always be remembered by the ornithological world as the Chief Editor of *The Birds of the Western Palearctic*. Five volumes of this unparalleled and truly monumental work have now appeared, and the remaining two are in an advanced state of preparation.

After war service as a navigator in the Royal Air Force, during which he spent some time in North America, Stanley left Bramhall in his native county and was soon established in Queen Square, Bloomsbury, where he lived for the rest of his extraordinarily busy life. I first met him at the Brent Reservoir in August 1947, soon after he had published a paper on territory in the coot (*Brit. Birds* 40: 194-198). This was based on 11 months' observations made in St James's Park in 1943 and 1944, and showed that he had already started work on the birds of the city centre. At the Brent Reservoir we spent some time puzzling over two small ducks in eclipse plumage, eventually deciding that they were garganey. I have never ceased to be amused by the fact that, whereas his record was accepted by the Records Committee, mine was rejected.

Stanley's acceptance of the main responsibility for *B.W.P.* came after a succession of brilliant achievements in the field of research and conservation, any single one of which would have made the reputation of most ornithologists. He had not only played a leading part in the organisation and development of all the principal bodies concerned with the British avifauna, but he had also worked with the International Council for Bird Preservation, and had chaired the group of scientists meeting in Brussels to consider the research requirements under the Directive on the Conservation of Wild Birds, which had been adopted by the Commission of the European Communities.

His work for the British Trust for Ornithology began modestly when he analysed the data on 561 Nest Record Cards for the willow warbler and published the results in 1955 (*Bird Study* 2: 121-135). He was the B.T.O. representative for the Society's Area from 1958 to 1964, and by the latter year he had served on the Trust's Council, been its Vice-President, become the first Chairman of its Scientific Advisory Committee and Chairman of the Nest Records Sub-Committee. In the early 1970s he served on the Populations and Surveys Committee and became its Chairman. Of paramount importance, however, was his work as Chairman of the joint B.T.O./R.S.P.B. committee that investigated the effects of pesticides on the vertebrate fauna of farmland in Britain. The Committee's reports provided irrefutable evidence of the ecological damage being caused by the use of chlorinated hydrocarbons.

Stanley was elected to the R.S.P.B. Council in 1960 and became its Chairman in 1966. He was a key member of the Home Office Advisory Committee on the Protection of Birds Act, 1967, and he gave the Nature Conservancy Council many valuable years' service, seven as a member of the Advisory Committee for England and four as Chairman of the Advisory Committee for Birds. In 1960 he became an Editor of *British Birds*, and he was soon its Senior Editor. He was still Chairman of the Editorial Board at the time of his death.

Concern over the threats to seabirds and the need for information on the changes in their numbers and distribution led to the establishment, in 1965, of the Seabird Group and the organisation of 'Operation Seafarer', the 1969-70 survey

of the coastal breeding seabirds of the British Isles. Stanley, the Group's Chairman, presented, with Bill Bourne and David Saunders, the results of this venture in *The Seabirds of Britain and Ireland*, published in 1974. The survey also helped to supply data for Stanley's paper on gulls nesting on buildings, which appeared in 1971 (*Brit. Birds* 64: 476-487).

His many achievements were justly rewarded – the B.T.O.'s Bernard Tucker Medal, the Gold Medal of the R.S.P.B., the Union Medal of the British Ornithologists' Union (of which he had been President), the Stamford Raffles Award of the Zoological Society of London (of which he was a Scientific Fellow), and the O.B.E. in 1975, for his work in conservation.

We in the L.N.H.S. are indebted to Stanley Cramp for his work on the birds of the built-up zone, particularly the 40-square-mile area nearest the centre, to which the ornithologist A. Holte Macpherson gave the name of 'Inner London'. Publication of Stanley's work on the coots in St James's Park was soon followed by a study of the bird populations of Regent's Park and Kensington Gardens. In preparing this he supplemented his own observations with those of the voluntary Official Observers appointed by the Ministry of Works to support the newly-reinstated Committee on Bird Sanctuaries in the Royal Parks. As a former Official Observer for Hyde Park and Kensington Gardens I was able to send him the information I had obtained in the Gardens in 1946 and 1947 before leaving London to work in Edinburgh. Our correspondence fuelled our common interest in urban birds, and on my return to London we joined forces to conduct, in the winter of 1948-49, a census of the birds of Kensington Gardens. A similar project had been undertaken by E. M. Nicholson and his brother, B. D. Nicholson, in the winter of 1925-26 (*Discovery*, August 1926: 281-285). In the winter of 1949-50 we carried out a census of the birds of St James's Park and The Green Park, for which I was now the Official Observer.

By this time we were considering the need for a new list of the birds of Inner London, to bring up to date that published by Holte Macpherson in 1929 (*Brit. Birds* 22: 222-244), and in 1952 we produced a paper (*Brit. Birds* 45: 431-456) covering the years 1900-1950 and commenting on the changes that had taken place. Even more remarkable changes were to follow, and a third paper, produced by Stanley Cramp and A. D. Tomlins (*Brit. Birds* 59: 209-233), appeared in 1966, spanning the period 1951-65.

Stanley and I hoped that our Inner London paper would make town-based birdwatchers in other parts of Britain more aware of the birds of the built-up environment, but there was no nation-wide response. The interest in urban ecology had yet to be aroused. The census work in the parks did, however, prompt other L.N.H.S. members to embark on far more detailed, long-term studies of London's parks and open spaces, and our counts along two stretches of the Thames in Inner London over the years 1951-53 encouraged Peter Strange-man to carry out similar observations in 1968-70 and 1979-81.

In 1957 Collins published the Society's book *The Birds of the London Area since 1900* in their New Naturalist series. Stanley and I wrote the chapter on Inner London, he collaborated with John Parrinder and Barney Richards to produce the chapter on roosts and fly-lines, and he tackled some of the species in the Systematic List. The book involved us in a lot of fieldwork in Inner London. We looked at localities that had been rather neglected by birdwatchers, like Victoria Park and Southwark Park, and investigated some that were closed to the public. He penetrated Surrey Commercial Docks, which were at that time still in use. I obtained permission to visit the garden of Lambeth Palace, and we both fought our way through the dense sycamore jungle that closed in on the ruins of Holland House. Our unauthorised examination of the derelict, warbler-haunted gardens of St John's Wood resulted in an encounter with the police, and we spent one terrifying lunch-hour following an agile and fearless custodian, at least 20 years our senior, on a high-level scramble through the bomb-shattered ruins of

Doulton's Lambeth pottery, where kestrels were suspected of nesting. We were part of the team that counted the starlings roosting in Central London in 1949-52 and helped to catch and ring 3,275 birds using the buildings around Trafalgar Square. We were also part of the team, headed by John Parrinder and Leslie Baker, that scanned the skies for visible migration. Stanley, the only one of us who was resident in Inner London, could do so from the roof of Queen Court; the rest of us had to use our office buildings.

When Holland Park was opened to the public in 1952 Stanley became the London County Council's Official Observer. He held this voluntary post until 1956, by which time his activities had begun to extend beyond Inner London. He organised an L.N.H.S. census of mute swans in 1955 and 1956, an operation he was to repeat in 1961. In 1957 he turned his attention to the autumn irruption of tits and other species noted in the London Area. This was an indication of a much larger movement and, after appeals for information had been made in *British Birds*, Stanley joined A. Pettet and J. T. R. Sharrock to analyse the immense quantities of British and Continental data. This material was skilfully and lucidly presented, three years later, in a three-part, 62-page paper in volume 53 of that journal. It was, in a way, a rehearsal for the role he was to play later in life.

Stanley's eternal search for the reasons for the fluctuations in bird numbers and changes in their distribution led him to consider whether the increase in insectivorous species in Inner London was related to the passing of the Clean Air Act in 1956, and he reviewed the situation in great detail in the *L.B.R.* for 1973. For years he had been interested in the effect that a polluted atmosphere might have on the food supply of aerial feeders like the swifts and hirundines. When he was 19 he and J. H. Ward had carried out a census of house martins and swallows near Manchester (*J. anim. Ecol.* 3: 1-7), and it is hardly surprising that he should organise a similar enquiry (which included the swift) a few years after his arrival in London. The return of the house martin to breed in Inner London in 1966, after an absence of 77 years, and its increase in the inner suburbs, was the subject of another paper, written in collaboration with John Gooders.

Although constantly busy, Stanley managed to find time to read the typescripts of other authors, and offer friendly and constructive criticism. His help is gratefully acknowledged at the end of 11 papers published in the *L.B.R.* between 1961 and 1977.

Stanley's knowledge of the birdlife of Inner London's open spaces qualified him as an ideal member of the Committee on Bird Sanctuaries in the Royal Parks. He joined in 1957 and in 1974 succeeded Lord Hurcomb as its Chairman. In 1979, however, the Government considered the Committee an unnecessary quango and abolished it. The first Committee had been appointed in 1922, and the reconstituted post-war Committee had been in existence for 33 years. All its distinguished members had given their services voluntarily.

In 1960 Stanley Cramp and Bob Spencer joined David McClintock's team of experts chosen to report on the fauna and flora of the garden of Buckingham Palace. Their survey of the breeding birds appears in the *Proceedings and Transactions of the South London Entomological and Natural History Society* for 1963, published in 1964.

Stanley was my guide and mentor. Although he was only six-and-a-half years my senior, I regarded him as a father figure. His prematurely grey hair and common sense had apparently earned him the same respect in the R.A.F. The two of us manned the Isle of May Bird Observatory for a week in the summer of 1949, and we spent two weeks in France in 1951, my first trip abroad. We had just over a day in Paris, where, almost out of habit, we carried out a bird count in the Parc Monceau. But most of our days were passed on the Biscay coast and in the High Pyrenees. Near Gavarnie we slipped on snow-covered ice and hurtled helplessly down the mountainside until our progress was arrested by some boulders. We were bruised, bleeding and lucky to be alive, and it was

unsympathetic of me, as a non-smoker, to make fun of his professed need for a nerve-settling cigarette.

I knew him as a wise, kind and patient friend. He seemed to have everything under control and working to a carefully planned time-table. He took his ornithology seriously, but he could be scathing about people whose only interest was in birds. He appreciated good music, painting, literature, the theatre and the art of film. He had a great sense of humour and a love of the ridiculous. We sometimes corresponded in humorous verse.

I left London in March 1963, immediately after the showing of the Society's film 'London's Birds' at St Pancras Town Hall, a venture which Stanley helped to make a success. Over the next 24 years, which were his finest, I was to see him on only six occasions. On the last of these, in April 1987, he was obviously very ill.

Stanley Cramp's death has robbed the Society and the world of ornithology of a man of remarkable talent. Those of us who enjoyed his company and friendship will treasure our memories of him for all our days.

W. G. TEAGLE

Stanley Cramp's contributions to the *London Bird Report*:

- 1949 The birds of Kensington Gardens and Regent's Park. **13**: 37-45.
- 1950 (with W. G. Teagle). A repeat bird census of Kensington Gardens. **14**: 41-48.
- 1950 The census of swifts, swallows and house-martins, 1949. **14**: 49-57.
- 1952 (with W. G. Teagle). A bird census of St James's Park and The Green Park, 1949-50. **15**: 48-52.
- 1955 (with W. G. Teagle). A comparative study of the birds of two stretches of the Thames in Inner London, 1951-1953. **18**: 40-57.
- 1957 The census of mute swans, 1955 and 1956. **21**: 58-62.
- 1960 The irruption of tits and other species in the London Area, 1957-58. **23**: 62-69.
- 1963 The census of mute swans, 1961. **26**: 100-103.
- 1967 (with John Gooders). The return of the house martin. **31**: 93-98.
- 1975 The influence of cleaner air on the breeding birds of Inner London. **38**: 65-72.

OLIVER BERNARD JOSEPH FRENCH, 1921-1988

Oliver French died suddenly on 17 August 1988, at the age of 67. He was born at Bookham, Surrey on the 1 June 1921 and was educated at Beaumont College in Surrey. He then became a clerk in the Civil Service. During the war he served in the Indian Army in Burma and later worked for five years for the United Africa Company in West Africa, during which time he developed an interest in natural history, especially birds. He joined the London Natural History Society in 1973 and became an active member of the Bookham Common Survey to which he became a great asset. An enthusiastic general naturalist he had wide interests and contributed many observations, especially on mammals, birds, vascular plants and mosses. His survey of the distribution of the rabbit in 1976-77, published in 1980 (*L.N.* **59**) shows the changes in location of rabbit colonies since the previous survey by M. Towns in 1969-70 (*L.N.* **51**). It was an interesting study in which he clearly took a great deal of trouble, while pointing out the difficulties. He made careful lists of plants eaten by rabbits and those avoided. When he found that the bryophyte flora was being brought up to date he quickly familiarised himself with the epiphytic bryophytes on trees and specialised in that group. He was most diligent in searching for new areas on the Common for a given species and this painstaking task sometimes resulted in a new record for the Common and even for the vice-county. The recent moss records for the Common were summarised in a joint paper with R. C. Stern in 1983 (*L.N.* **62**), and Oliver French has since then produced annual reports giving new area records.

Oliver was also very helpful with the menial chores at teatime in the hut, and many have enjoyed the hospitality of his home after a meeting, memorable for Kathie's home-made teas and lively discussions. His microscope was always 'at the ready'. He was a most enthusiastic gardener and a keen philatelist. Our sympathy goes to his wife, Kathleen, and his two daughters and son. He will be greatly missed.

GEOFFREY BEVEN and ELLA M. HILLMAN

1986	Income	£	£	1986	Expenditure	£	£
	Income from members and supporters:				Meeting costs, sectional and general expenditure:		
7,038	Subscriptions	6,944		1,388	Hire of halls and rooms	1,674	
74	Entrance fees	60			Lecturers' fees and expenses, sectional expenses, etc	1,261	
469	Donations	279		1,145	Postage and telephone	142	
	Tax recovered on covenanted subscriptions	597		108	Stationery	110	
551					Services (Auditors' fees, insurance, etc.)	849	
8,132	Sales: Journals	1,099	7,880	724	Honoraria and expense allowances	730	
	Less: Expenses	(139)		1,018	Equipment repairs and renewals	93	
	Bulletin subscriptions	960		12	Depreciation	2,360	
22	Literature and surplus library stock	16		2,360			7,219
197	Journal offprints	31			Publications		
32	<i>Flora of the London Area</i>	20			Printing and expenses		
389	Less: Expenses	559		3,562	<i>London Naturalist</i> 65	5,327	
(51)		(30)		3,729	<i>London Bird Report</i> 50	6,587	
1,332	Income from investments and deposits:		1,556				
10,562	Stocks and shares	11,118		7,291	<i>Programme and Rules</i>	11,914	
4,422	Tax recoverable 1986/87	3,421		923	<i>Bulletin and Newsletter</i>	896	
968	1987/88	967		333	Mailing	1,293	
	Investment cash account	4,388		1,652			
60	Profit on sale of investments	65			Library		16,028
4,484		52,742		625	Publicity		939
	Less: Custodian's charges	68,313		279	Grants, including contributions to other organisations		1,224
(2,167)	National Savings Bank and Charities Deposit Fund	(3,255)			Bat project		
	Bank deposit account	65,058		2,496	Other	626	
1,031		265		350			626
211		33			Total expenditure for the year		£26,036
19,571			65,356	2,846			
	Share of conference surplus and other income			£20,855			
—	Total Income		59				
29,035	Less: Expenditure		74,851				
(20,855)	Surplus for the year		(26,036)				
£8,180			£48,815				

Balance Sheet as at 30 June 1987

H. M. V. WILSDON President
J. H. SAND Treasurer
Dated: 7 October 1987

Report of the Auditors to the Members of the London Natural History Society

We have audited the attached financial statements in accordance with approved auditing standards.

In our opinion these statements give a true and fair view of the income and expenditure of the Society for the year ended 30 June 1987 and of its assets, liabilities and fund balances at that date.

4 London Wall Buildings
LONDON EC2M 5NT
7 October 1987
FRASER KEEN
Chartered Accountants

Note to the Accounts

Accounting Policies

The accounts are prepared on an accruals basis. Provision is made for all material debtors and prepayments and creditors and accruals with the exception noted below.

However, subscriptions, which are collected on a calendar year basis, continue to be brought in as received and all 1987 subscriptions have been taken to income in these accounts.

1986	£	£	£
<i>Fixed Assets</i> acquired after 30 June 1986.			
excluding library books:			
computers, including ancillary equipment and initial programming costs.....			
10,342	10,342		
143	143		
906	906		
413	413		
11,804	11,804		
(2,360)	(4,720)		
9,444		7,084	
150,613		195,064	
<i>Quoted Investments</i> at cost.....			
(Market value £348,978 - 1986: £274,779)			
<i>Current Assets</i>			
Funds at bank and on deposit:			
1,487	54,438		
1,050	2,750		
1,224			
3,761	57,188		
173	438		
2,586	104		
968	1,060		
470	400		
7,958		59,190	
<i>Less: Current Liabilities</i>			
Investment purchases awaiting completion.....			
2,644	44,044		
100	3,255		
997	100		
	850		
		(48,249)	
		£213,089	
Total net assets.....			
Representing: <i>General Fund</i> (incorporating the Hindson and Castell Bequests)			
156,094	164,274		
8,180	48,815		

Society Grants

The Society sets aside a small amount each year to assist conservation work, the establishment or maintenance of nature reserves and scientific investigation in the London Area. Applications for grants and loans are considered by the Administration and Finance Committee: enquiries should be addressed to its Secretary. Papers reporting results of research supported in this way must be submitted for publication in the Society's journals.

The London Naturalist

Instructions to contributors

Submission of papers

Papers relevant to the natural history and archaeology of the London Area should be submitted to the editor, Mr K. H. Hyatt, c/o Department of Zoology, British Museum (Natural History), Cromwell Road, London SW7 5BD, before the end of January if they are to be considered for publication in the same year. They should be typed, with double spacing and wide (three cm) margins, on one side of the paper. Authors must retain a duplicate copy. Papers should include at the beginning an abstract, summary, or synopsis.

Text

Locality spellings should follow the latest editions of the maps published by the Ordnance Survey. Capitalization should be kept to a minimum. Common names of animals and plants must begin with lower-case initials, and scientific names must be underlined. When both common and Latin names are given there should be no brackets or commas separating them. Genus names should appear in full where first used within each paragraph. When scientific names are taken from a standard work, which must be cited, authorities should be omitted. In descriptive matter numbers under 10 should be in words, except in a strictly numerical context. Dates should follow the logical sequence of day, month, year (i.e. 25 December 1971). Measurements should be in metric and follow the SI system (Système International d'Unités), with imperial equivalents in parentheses where appropriate. There should be no full point following Dr, Mr, Mrs or St. Lists should be in natural, alphabetical or numerical order.

References

Reference citation should be based on the Madison rules (in *Bull. Torrey bot. Club* **22**: 130-132 (1895)), except that a colon should always precede a page number. Capitalization in titles of papers in journals should be kept to a minimum. Journal titles should follow the abbreviations in the *World List of Scientific Periodicals* and be underlined. Examples are as follows:

In text:

Meadows (1970 : 80) or (Meadows 1970).

In references:

MEADOWS, B. S. 1970. Observations on the return of fishes to a polluted tributary of the River Thames 1964-9. *Lond. Nat.* **49**: 76-81.

MELLANBY, K. 1970. *Pesticides and Pollution*. Ed. 2. Collins, London.

WHITE, K. G. 1959. Dimsdale Hall moat, part II. *Trans. a. Rep. N. Staffs. Fld Club* **92**: 39-45.

Illustrations

Distribution maps should be submitted in the form of a Recording Map with symbols in Indian ink or Letraset. Solid dots are used to indicate contemporary or recent presence, circles for old records and crosses (not pluses) for other information, such as introduced species. Tetrad dots and circles should be 4.0 mm and tetrad crosses 5.0 mm, with a line thickness of 0.8 mm; all monad symbols should be 1.6 mm with a line thickness 0.5 mm. The caption should be written outside the frame of the map and will be set up by the printer. The Mapping Schemes Secretary can provide Recording Maps, advice and dies for printing distribution symbols.

Line drawings should be in Indian ink on white card, larger than the printed size. Place names, etc., must be produced with stencils or Letraset. Captions should be separate as they will be set up by the printer.

Photographs should be glossy black-and-white prints, of good contrast, preferably half-plate in size.

Proofs

Proofs will be sent to authors for scrutiny, but only essential corrections can be made at that stage.

Reprints

Up to 25 free reprints will be supplied on request. Additional copies may be purchased if ordered when the proofs are returned.

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